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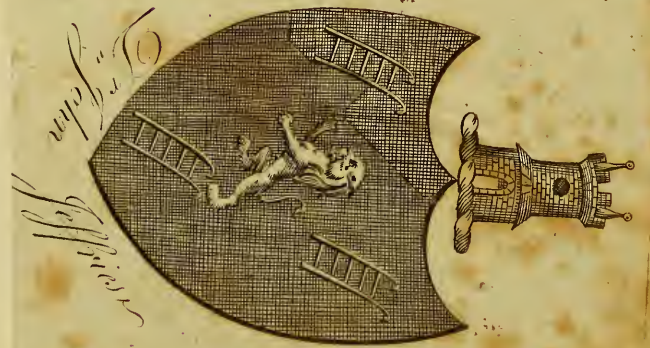

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A

# PRACTICAL SYSTEM

OF

# SURGERY.

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HARVARD

BY JAMES LATTA,
SURGEON IN EDINBURGH.

ILLUSTRATED WITH CASES ON MANY OF THE SUBJECTS, AND WITH COPPERPLATES.

*IN THREE VOLUMES.*

## VOLUME III.

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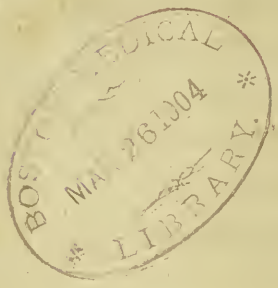

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A

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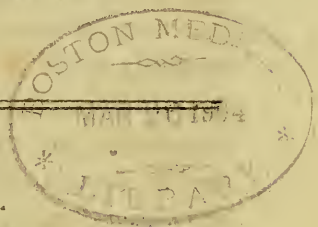

## CHAPTER I.

### *OF WOUNDS IN GENERAL.*

VARIOUS definitions of a wound have been given by chirurgical writers, moſt of which only ſhow the inſignificance of attempting to make plainer what every body knows already. For form's ſake, I define a wound to be a recent ſeparation of ſubſtance in any ſoft part of the body by external violence; and, from this definition, it is evident, that, according to the nature of the part wounded, the injury muſt be attended with ſymptoms more or leſs dangerous to the patient, and alarming to the ſurgeon. Much alſo depends on the habit of body in which the patient

is at the time of receiving the wound; for, in ſome caſes, the tendency to mortification is ſo great, that the ſlighteſt wound proves fatal in a very ſhort time, while, in others, we find the moſt dangerous wounds healed without any difficulty. Captain Cook, in the account he gives of the nations in the South Sea, takes notice that their wounds are very eaſily healed, and that they recover from ſuch injuries as would infallibly prove fatal to an European. Tupia, one of theſe people, who accompanied the Captain during part of the voyage, and afterwards died at Batavia, had been run quite through the body by a ſpear. Theſe weapons, among the South Sea iſlanders, are capable of inflicting the moſt dangerous wounds, being headed with the bone of a fiſh, called the *ſting ray*, which is full of barbs, and, when driven through the body, one ſhould think, could ſcarce be extracted without immediate death; yet, not only Tupia had recovered from a wound ſo extremely dangerous, but the author of the voyage informs us, that he had ſeen others who bore the marks of injuries ſtill greater. Whether this ſurpriſing facility, with which theſe people recover from their wounds, be a conſequence of their enjoying a fine climate, or an effect of the ſalubrious food they uſe, cannot well be determined. It ſeems to be a fact, however, that the wounds of all ſavages,

ſavages, (the Hottentots themſelves not excepted), will heal more eaſily than of thoſe who have been accuſtomed to a civilized life.

The diſtinctions which chirurgical writers have made of wounds into different kinds, are as various as their definitions, and as little to the purpoſe. In my opinion, every wound that can be inflicted on the human body may be comprehended under one of the following heads. 1ſt, The ſimple inciſed wound. 2d, The lacerated wound. And, 3d, The complicated wound. The ſimple inciſed wound is merely a cut, in ſome ſoft part, with a knife or other ſharp inſtrument; and, according to the direction of the cut, the wound is either longitudinal, or tranſverſe. It is longitundinal when the cut happens to be parallel to the fibres of any muſcle, and tranſverſe when it runs acroſs them. This direction of the cutting inſtrument, however, makes a very conſiderable difference in the circumſtances of the wound, and is even ſometimes the cauſe of dangerous miſtakes on the part of the ſurgeon. A tranſverſe wound always gapes very much; inſomuch, that ſometimes it gives room to ſuſpect a loſs of ſubſtance. It is therefore, when large, always accounted a matter of importance, and requires proper attention to be paid to it. A longitundinal wound, on the other hand, though of equal extent, gapes much leſs, and is therefore

therefore apt to be conſidered as ſlight; when, in fact, it is otherwiſe; and, by neglect or delay of proper applications, may at laſt prove extremely dangerous.

All recent inciſed wounds are attended with an effuſion of blood, more or leſs, according to the ſize of the blood-veſſels divided. When any large arteries or veins are divided, eſpecially the former, the hæmorrhage muſt of courſe be very alarming and dangerous, or even inſtantly fatal; when the veſſels are without the reach of ligature, or when they are ſo large that the quantity of blood they diſcharge proves inſtantly inconſiſtent with the exerciſe of any of the vital functions. Where the blood-veſſels are within our reach, they muſt, if of any conſiderable diameter, be inſtantly ſecured by ligature; but where they are of ſmaller ſize, and the air has free acceſs to the wound, they ſoon ſtop of themſelves. This is occaſioned by a conſtriction of the ends of the divided veſſels, and not merely by their being plugged up with coagulated blood, as might be ſuppoſed. Hence, the diſcharge of blood is ſucceeded by one of ſerum; and, if the lips of the wound happen to have been brought into contact with each other by means of future, the diſcharge will act as a kind of cement, by which the extremities of the divided veſſels will be united, and the wound healed

ed by what is called the firſt intention. But, if this has not been done, the diſcharge of ſerum will alſo ſtop, and this fluid, along with the effuſed blood, be converted into an hard dry cruſt, under which the divided ends of the veſſels are elongated, and at laſt fill up the gap made by the retraction of the lips of the wound. But, when wounds are left to heal in this manner, the cure is always much more tedious than when they heal by the firſt intention. If the wound, indeed, is but of ſmall extent, the cruſt or ſcab will remain till the ſkin becomes perfectly whole underneath, after which, the cruſt falls off; but, where the wound is large, a quantity of matter is formed, ſwells up the cruſt, and converts the whole into a kind of abſceſs, which, if the patient is of a bad habit of body, may degenerate into an ulcer, extremely difficult to heal; of which kind of wounds we ſhall afterwards treat particularly. I only mention this at preſent, in order to point out the mode in which nature accompliſhes the healing proceſs. That the blood is ſtopped by the exertion of the contractile power of the veſſels, and not by a clothing of the fluid itſelf, is evident; for, if the veſſels were prevented from bleeding, merely by being plugged up with coagula of blood, the leaſt irritation might renew the hæmorrhage. The truth of what I have juſt now ſaid will likewiſe appear, even from

a conſideration of the anatomical ſtructure of an artery. When perfectly divided, its circular fibres contract the divided extremity in a ſhort time, and its ſides ſoon after grow together, from the inflammation that takes place in the wound; and this may be ſeen by any perſon who has acceſs to the diſſection of a ſtump in any patient that has died after the amputation of a limb.

Simple inciſed wounds are, for the firſt twelve or fourteen hours, attended with little or no pain. After this, however, ſome degree of pain is felt, attended with redneſs, tenſion, and ſwelling, which abate after a plentiful formation of matter. This, however, takes place only in wounds of the cellular ſubſtance and muſcular parts; for, where the nerves and membraneous parts are much injured, though the patient labours under the moſt exquiſite pain, and even tetanic affections, yet no kindly ſuppuration happens; and it is a certain maxim in ſurgery, that where wounds can be brought to proper ſuppuration, no tetanic affections, even in the warmeſt climates, ever does take place.

Extenſive wounds are frequently attended with feveriſh ſymptoms, ſuch as heat, quick pulſe, and thirſt; theſe continue and increaſe, till the ſurface of the wound, which has, for ſome time, been almoſt dry, begins to be moiſtened by a new emiſſion of ſerum on the ſurface, which, by the

the action of the heat and other causes, is converted into a thick, mild, and mucilaginous fluid, called pus, or purulent matter; and, in proportion as this fluid is produced in greater or smaller quantity, the febrile symptoms are more or less acute. In some cases, however, where the patient is of a bad habit of body, the inflammatory symptoms run so high, even in cases of simple wounds, that a mortification quickly ensues. The wound is only an exciting cause of the inflammation, as must plainly appear from what has been already said of inflammation; but with this difference, that in all simple incised wounds, whether longitudinal or transverse, they may, by means of future, be made to heal without any inflammatory symptom whatever; or, at least, without any danger of mortification, or even appearance of suppuration. This I hope to demonstrate in the course of this treatise, and to shew, that, whenever wounds are healed in any other way than by the first intention, where the patient is healthy, and neither any aponeurosis, or any part of the periosteum is divided, the surgeon has certainly committed a fault in neglecting the most simple and easy method of cure, and adopting a more tedious and painful one. Should the method of future, however, be adopted, and the parts about the wound inflame and swell considerably, these symptoms must

muſt be abated by topical bleeding, and other remedies already directed, when treating of inflammation. Thus, we will almoſt always ſucceed; but if, in ſome caſes, matter ſhould be formed, it muſt never be allowed to lodge for any length of time in the wound; for, though at firſt it is a ſalutary balſam for healing it, yet, when confined, it very ſoon aſſumes ſuch an acrid nature as makes it quite noxious; and, inſtead of promoting the cure, entirely preventing it from taking place.

Lacerated wounds, which form the ſecond claſs, are of a much more dangerous nature than the former; for here the ſeparation of the parts is irregular, and the fibres violently ſtretched, as being partly torn aſunder by the extreme violence ſuffered in the infliction of them. They are not produced by ſharp inſtruments as the former, but by thoſe of an irregular figure, which, at the ſame time that they cut, bruiſe and tear the parts, and, indeed, the wounds that are made by puncture, as by ſmall ſwords, bayonets, &c. which penetrate very deep, are no leſs dangerous than thoſe that are properly called *lacerated.* Great danger, in caſes of punctured wounds, ariſes from the chance there is of ſome of the vital parts being injured; and, even though this ſhould not be the caſe, the depth of the wound rendering the evacuation of

the matter extremely difficult, it is thence apt to become acrid, and produce very alarming ſymptoms, by being abſorbed into the blood.

In lacerated wounds, when the injury has not been extremely ſevere, the parts will ſometimes recover their tone; and, where the wound is only in a fleſhy part, we may ſometimes apply future, even though there be a conſiderable degree of laceration; or, if the ſuppuration be moderate, the ſore will frequently be reduced to the nature of a common purulent ulcer. If the injury, however, has been very violent, ſo that the texture of the parts, and circulation of the blood, is entirely deſtroyed, or nearly ſo, there is the utmoſt danger of a mortification; of which we have many inſtances in gunſhot wounds, or where the extremities have been torn off by machinery. In ſuch caſes, it is no uncommon thing for a gangrene to take place very rapidly. When people are injured by machinery, the upper extremities commonly ſuffer; and, unleſs the utmoſt care be taken to keep down the inflammation, a gangrene will almoſt certainly take place; and, indeed, I have always obſerved, that, in caſes of this kind, the mortification comes on more quickly than in any other.

The third claſs, which I have called complicated wounds, are attended with one or other of the following circumſtances, viz. contuſion, loſs

of ſubſtance, the diviſion of ſome of the large nerves, arteries, injuries of the bone; and, hence, gunſhot wounds are, for the moſt part, to be ranked with thoſe of a complicated nature, as well as thoſe made by ſplinters, glaſs, &c. and venomous wounds. In ſhort, all theſe in which ſome extraneous body is lodged in the part.

Inciſed wounds bleed freely, while complicated wounds ſeldom bleed any for the firſt five or ſix days, particularly in ſuch as are the effect of fire arms. This is occaſioned by a kind of eſchar, formed by the ball, which, for a time, plugs up the mouths of the divided veſſels; but, about the ſixth day, this begins to looſen, and the veſſels pour forth their blood in proportion to their ſize, ſo that the patient will often be in great danger, unleſs the ſurgeon pays particular attention to him; and, therefore, this is a piece of knowledge of which no ſurgeon ought to be deſtitute. In complicated wounds alſo, the pain, and every other ſymptom of inflammation, is much more violent than in an inciſed, or even a lacerated wound, eſpecially when ſeated near a joint; and, if a great degree of contuſion has taken place at the time the injury was received, it is very probable that a gangrene will enſue.

In caſes of hæmorrhage, we may know by the manner in which the blood flows out, and by its colour, whether it be an artery or vein which is cut.

cut. In the former caſe, the blood ruſhes out by ſtarts, and is of a fine florid colour; but the venal blood is dark coloured, and runs in an equal ſtream.

Injuries of the nerves are known by ſevere ſhooting pains, with flaccidity in the wounded part, violent ſpaſmodic affections of the limb, without any inflammation; convulſive and ſpaſmodic affections along the under jaw and throat. Theſe are accompanied by rigour, heat, violent fever, and delirium, which are commonly ſoon ſucceeded by death.

Where the fleſhy parts only are wounded, the pain is ſeldom very acute, and the ſymptoms are not dangerous; though pain, heat, redneſs, ſwelling, and pulſation, are the common conſequences of all wounds, but eſpecially in thoſe of membraneous parts, and where the air is allowed to have acceſs to the wound. It is a ſign that the vital powers are deficient, where the wound is but little inflamed, and the parts adjacent are flabby, and aſſume a yellow colour. Should theſe ſymptoms continue and increaſe, there is great danger of a gangrene coming on.

Wounds of the lungs, abdomen, thorax, and large joints, are always attended with much danger; thoſe of the ſpinal marrow abſolutely mortal; and, in conſequence of a wound there, the parts immediately below the injured part become paralytic,

paralytic, and continue ſo as long as the patient lives.

It is difficult to determine the ſeat and extent of deep wounds, becauſe we cannot have acceſs to them. This can only be done by the direction of the wounding inſtrument, the nature of the diſcharge, and the ſymptoms produced by them. Thus, in wounds of the trachea, the breath paſſes through the opening; the blood which is extravaſated internally is coughed up through the wound, and the patient cannot ſpeak or breathe but with the utmoſt difficulty. Wounds of the œſophagus or gullet are known by the food, but eſpecially the drink paſſing out through the wound, whenever the patient attempts to ſwallow; and, in general, injuries of this kind are attended with hiccup, vomiting, fainting, &c. even though the utmoſt care be taken. Wounds of the lungs are known, by the coughing up of a conſiderable quantity of frothy blood, and the ſame forced through the opening every time the patient expires. Throughout the progreſs of the diſeaſe the patient is liable to pain, difficulty of breathing, and delirium; and, in caſes of this kind, emphyſematous ſwellings frequently appear about the wound, and ſometimes over the whole body. Wounds of the diaphragm are commonly attended with a conſiderable degree of dyſpnœa, hoarſeneſs, ſpitting of blood,

and

and pain under the falſe ribs. In wounds of the receptaculum chyli, the patient is generally attacked with a looſeneſs; the diſcharge being of a whitiſh colour, the body falls away, though the moſt nouriſhing food be given, and at laſt death enſues, merely from inanition. We have reaſon to ſuppoſe that the liver is wounded, by the paſſing of a very dark coloured blood through a wound in the right hypochondrium, attended with a pain ſtriking up from the wounded place to the top of the ſhoulder. Symptoms of a ſimilar kind, along with a ſlight difficulty of breathing, ſhow the ſpleen to be wounded. Wounds of the ſtomach are known by the paſſage of the food through a wound below the cartilago enſiformis, attended with hiccup, vomiting, and an almoſt dead coldneſs of the extremities, together with great pain immediately below the cartilage. Wounds of the ſtomach are likewiſe attended with an almoſt univerſal cold ſweet. If the undigeſted aliment, mixed with chyle, paſſes through a wound in the parietes of the abdomen, the ſmall inteſtines are certainly wounded; and we know that the large inteſtines are wounded by the diſcharge of fæces through the wound. When the gall-bladder or duodenum are wounded, the direction of it will be towards the concave part of the liver, on the right ſide of the ſpine, and a quantity of alimentary

mentary matter, mixed with bile, will be discharged. In wounds of the kidneys, the opening is immediately contiguous to the ſpine, and juſt above the under falſe rib; the urine is bloody; the wound extremely painful; and the pain reaches down to the groin and teſticles.

Wounds are produced ſometimes by mere diſtention and rupture of the fibres, but moſt commonly by the impulſe of a ſharp inſtrument. It is not, however, neceſſary that the inſtrument be ſharp for the purpoſe of making a wound, provided a ſufficient degree of force be applied; only the more blunt the inſtrument is, the greater will the contuſion and laceration be. Nature is the principal, indeed, we may ſay, the only agent in the cure of them, though, by means of certain external applications, as well as internal medicines, we may greatly facilitate the operations of nature. To underſtand how this may be done, we muſt conſider, that, as the growth and preſervation of the whole body is entirely a natural operation, ſo muſt the reunion of a divided part, or the reproduction of one that is loſt, alſo be. As the growth and well being of the whole body, however, depends on the uſe of certain means; ſo the healing of a wound muſt likewiſe depend in a great meaſure upon theſe means. Thus, if a perſon feeds upon putrid food, if he drinks corrupted water, or is confined

confined in an unwholeſome place, the powers of nature are by no means able to preſerve him in health, neither will they be able to heal a wound with ſuch eaſe as in other caſes. Inſtead of this, the ſlighteſt ſcratch will, under ſuch circumſtances, degenerate into an incurable ulcer; nay, wounds that have formerly been healed will burſt open; the callus of broken bones be diſſolved; and the moſt extraordinary and unaccountable appearances take place, as has often happened in the ſea ſcurvy. In ſuch caſes, internal medicines are abſolutely neceſſary to reſtore the powers of nature, before we can think of curing the wound; for it is altogether impoſſible that a part can be regenerated where the whole fabric is going to deſtruction. Again, let us ſuppoſe that a wound is made acroſs any fleſhy part, and gapes very much; if we allow it to remain in this ſituation, there is no natural power by which the divided parts can be brought together; on the contrary, the natural elaſticity of the fibres cauſes them to ſeparate more and more. Here, nature requires to be aſſiſted by external means; the ſides of the wound are to be made to approach one another by artificial means, ſuch as future, or otherwiſe, and thus to be kept for a conſiderable time. Nature then has an opportunity of performing her part in the moſt advantageous manner; the ends of the divided veſſels

veſſels quickly unite, and the wound heals, by what is called the firſt intention. Any further aſſiſtance that can be given to nature in this caſe, is to abate the inflammatory ſymptoms by topical bleeding, and other proper remedies; taking care, at the ſame time, not to weaken the powers of nature ſo much that they cannot reunite the divided veſſels.

Here, it may not be amiſs to take ſome notice of the balſams and ointments which have formerly been ſo much celebrated in the cure of wounds, and which are now almoſt totally exploded. No doubt, a great part of the virtues attributed to theſe are juſtly aſcribed to ſuperſtition, and to the notion that diſeaſes were to be cured by magic art; as we are told, that, in the early ages, the medicinal art was entirely in the hands of pretended magicians, and to this day, continues to be ſo among the barbarous nations. We cannot, however, deny that the healing of wounds is promoted by ſome kinds of applications. Thus, in cancerous caſes, the carrot poultice evidently gives a cancerous ſore ſome tendency to heal, as it abates the fœtor, though it cannot remove that corroſive diſpoſition of the humours which renders this diſeaſe incurable; but, in other ſores, though evidently approaching very much to the nature of a cancer, it has been undoubtedly found to produce

a diſpoſition to heal, when, in all probability, the patient would have been deſtroyed without it; of which, we have ſeveral inſtances in the Medical Obſervations. But, though this has undoubtedly an effect, in caſes where the habit of body is diſeaſed, and the wound has put on a very bad appearance, it does not, however, from thence follow that the conſolidation of a wound can be accelerated by any application whatever. Indeed this is ſo quick, where favourable circumſtances concur, that we can hardly deſire any improvement; for, where the lips of a wound have been brought together by ſuture, the threads may be removed in three days, which ſhows that the divided veſſels have grown together in that time, though it will ſtill be proper to put on ſtraps of adheſive plaſter to keep them from being torn aſunder. Among the Jews, we find that a balſam, called the balm of Gilead, was formerly much celebrated. Among the Arabians, the balſam of Mecca is highly extolled. The Perſians boaſt of a precious liquor, called *Mummy*, which flows naturally out of a rock, and which is ſaid to heal the moſt violent wound in twenty-four hours. Among ourſelves, the traumatic balſam has been much celebrated as a vulnevary. This is a ſpirituous tincture extracted from ſome kinds of reſinous ſubſtances, and its natural effect, when applied to a recent

wound, is to contract the mouths of the veſſels, coagulate the blood, and thus ſtop a ſlight hæmorrhage. When this is done, and the ſides of the wound be kept together, they will very quickly unite; but, except it be the ſudden ſtoppage of a ſlight effuſion of blood, it does not appear that the balſam has any ſhare in the cure; unleſs perhaps, that, by reaſon of its tenacity when evaporated, it may in ſome meaſure anſwer the purpoſe of a ſuture or adheſive plaſter, by keeping the lips of the wound together. The oriental balſams are ſo ſcarce, and, in all probability, ſo much adulterated by the time we get them, that we can ſay little about them. All that can with certainty be known about them is, that they muſt either be produced from vegetable or mineral ſubſtances; in the former caſe, they are ſimilar to turpentine; in the latter, to rock oil; but, whether they belong to the one claſs or the other, it is certain that they muſt be of a very heating nature, and of conſequence improper to be applied to recent wounds. It is probable, indeed, that all of them have derived their character from the mere circumſtance of keeping the ſides of the wound together, by which means it has healed by the firſt intention, and the cure has then unjuſtly been aſcribed to the balſam.

But, though it be very doubtful whether we can, where the patient is healthy and vigorous, accelerate

accelerate the conſolidation of the divided parts, there are many applications which tend to promote the cure, where the parts happen to be any way ſlightly diſeaſed. Thus, in caſes of too great relaxation, the wound is apt to fill up with a ſoft ſpongy ſubſtance, called *fungous* or *proud* fleſh; or ſometimes with a white, viſcid, and tenacious matter, which, inſtead of promoting, entirely retards the cure. Eſcharotics or aſtringents are abſolutely neceſſary to take off theſe; as, on the other hand, ſoft and oily applications muſt be uſed for the moſt part to keep the ſoft ends of the veſſels warm, and exclude the external air as much as poſſible. In like manner, when the wound is entirely filled up, and only the ſkin wanting, there are means to be uſed for making the ſkin cover the place exactly, and ſmooth, without any diſagreeable appearance of the cicatrix after the cure is completed. Of theſe applications, however, I ſhall ſpeak particularly, when treating of wounds in the various parts of the body.

There are three different ways in which a wound may be cured, of which that, by the firſt intention, already deſcribed, is the moſt ſimple, eaſy, and expeditious. It is produced by the union of the recently divided veſſels with one another. The ſecond takes place where the wound has been for ſome time expoſed to the air;

air; in consequence of which, the vessels have collapsed and contracted, so that they cannot unite with one another in the manner they do in the former case. Nevertheless, if the sides of the wound be then brought together by suture, the cure will be completed, by means of inflammatory adhesion, but without any appearance of suppuration. The last and most tedious way in which a wound can be cured, is by suppuration, granulation, and cicatrisation. When there has been a considerable loss of substance where the wound is deep and much lacerated, or where foreign bodies have been lodged in it, we cannot avoid this suppurating method; but it too frequently happens that surgeons bring their patients to all this trouble, merely through neglect of retaining the sides of the wound in contact with one another, until they adhere. Even here, however, we ought to bring the lips of the wound as near to each other as we can, and keep them so, by means of adhesive plasters. In other respects they must be treated as complicated wounds. We are, therefore, carefully to remove every extraneous body, to stop the hæmorrhage; and, after having cleaned the parts properly, to dress the wound with cerate spread on linen, and laid round its edges, putting over all a pledget spread with simple cerate.

In all wounds, after a free ſupuration has taken place, we muſt take care to avoid every thing which may tend, in the ſlighteſt degree, to bring back the inflammatory ſymptoms; and, on this account, no acrid application muſt be made uſe of. Sometimes it will be neceſſary to uſe emollient poultices to promote the ſuppuration; but theſe muſt not be too long continued; nor ought they ever to extend beyond the limits of the wounded part; and, if tumefaction and tenſion ſtill continue in any great degree, and ſpread over the adjacent parts with increaſing pain and inflammation, we muſt apply leeches. After they are taken off, the inflamed parts muſt be kept conſtantly covered with cloths, dipped in ſugar of lead, till the ſymptoms are entirely gone. The poultices, in ſhort, ought never to extend more than two inches beyond the lips of the wound; for it is ſuppuration in the wound, not in any of the adjacent parts, that is wanted; and thus we may prevent thoſe tedious and dangerous ſuppurations which often run along in the interſtices of the muſcles, and along the bone, and which give much trouble, both to the patient and ſurgeon.

Where wounds are attended with great pain, we muſt adminiſter opiates freely, and in large doſes, along with the bark, and proper cordials. Food muſt be given to the patient according to the

the conſtitution of body, and degree of health he enjoys, which will be known by the appearance of the wound. In caſes of hæmorrhage, we muſt uſe the tenaculum and ligature for tying up the bleeding veſſels as formerly directed; but, in caſe theſe cannot be applied, or prove inſufficient, we muſt compreſs the mouths of the veſſels with ſponge, or agaric, kept cloſe to the place by proper bandages. During the cure, the patient muſt be kept quiet, and allowed only a low diet, till there be no longer any danger of an hæmorrhage. Amputation ought not to be thought of, unleſs in ſuch caſes as, without it, would certainly be attended with the death of the patient. Even though very large arteries ſhould be wounded, we are not from thence haſtily to conclude that the limb ought to be amputated. There are many inſtances, both of the femoral and brachial artery being wounded very high up, and no amputation neceſſary; both ends of the divided veſſel being taken up by a ligature, and the cure performed, as after the operation for an aneuriſm.

I ſhall conclude this ſubject with the following ſhort directions, which the practitioner may always eaſily remember, and keep in view. In all wounds, when cleared of extraneous bodies, the lips ought to be brought together as nearly as poſſible, and kept in that poſition, by ſlips of

adhesive plaster; the wound itself being dressed with lint, moistened in traumatic balsam, to prevent the admission of air. Cloths, moistened in a solution of sugar of lead, are afterwards to be applied, in order to prevent or allay the inflammatory symptoms. The cure ought to be performed as much as possible by the first intention; but what cannot be healed in this manner, but remains in the form of an ulcer, must be dressed, after suppuration takes place, with simple dressings, such as straps of linen, spread with cerate, laid round the edges of the wound; and, if much matter be discharged, some scraped lint should be put on to absorb it. But, where the discharge is moderate, we may apply a dressing of simple cerate once every twenty-four hours, or oftener, if necessary, with a small bolster of tow upon it, and a compress of linen over all; keeping on the dressings in summer with a roller of linen, but in winter with a flannel roller to keep the parts more warm.

Sometimes, however, we may meet with wounds, of which the lips cannot be brought even near to each other; but yet, in these, we must strive as much as possible, by means of bandages along with adhesive straps, to make them approximate; or, at least, to prevent them, by such means, from retracting farther from each other. That part of the wound which remains

open

open muſt be covered with a pledget, ſpread with ſome ſoft ointment; or, if that is not at hand, with fine ſallad oil, void of all rancidity; which, where it can be procured, will be found a very good ſuccedaneum for ſuch ointments as ought to be made uſe of here; and, when this is applied, we may uſe either a double headed or a circular bandage, as circumſtances require. If the ſuppuration does not freely come on in a day or two, and the pain is very ſevere, we muſt apply an emollient poultice, but only over the wound; for, in no caſe of this kind, ought it to go beyond the place where the ſkin is broke. By neglecting this precaution, we will be in danger of producing ſinuſes, which will often run much deeper than we would have thought they could do. When ſuch ſinuſes are formed, all the ſurrounding parts become flaccid; whereas, when a free and full ſuppuration comes on in the wounded place only, healthy granulations of fleſh begin to ſhoot up from the bottom of the wound. When theſe are perceived, the healing proceſs is begun, and the poultice muſt be removed. We are now alſo to dreſs the wound in a different manner from that above directed. Inſtead of putting ſtraps, ſpread with ſimple cerate, round the edges, with ſome dry ſcraped lint in the middle, we are to put, over all, a pledget covered with ointment made of white wax and oil;

oil; and, of this kind, the unguentum ſimplex of the Edinburgh College is the beſt I know. The dreſſings are to be kept on by a fold or two of linen, over which a bandage is applied.

All this time, we are ſtill to uſe our utmoſt endeavours to keep the lips of the wound as near each other as poſſible, by means of compreſſes, bandages, &c. that the cicatrix, when formed, may be as ſmall as poſſible. The dreſſings are to be allowed to ſtay longer on at the firſt than at any other time; nor ought they to be taken off till they come eaſily, which will generally be about the fifth day. After this, they ought to be changed once in twenty-four hours, which will generally be ſufficient, unleſs the diſcharge be very great, and the weather extremely warm, when they muſt be taken off every twelve hours; for nothing impedes the cure of a wound more than its being covered with acrimonious matter; whether ſuch acrimony be produced naturally, or by allowing the dreſſings to remain too long upon it. We muſt not, however, continue this frequent dreſſing till the cure be completed. When the diſcharge begins to abate, and the ſize of the ulcer to diminiſh, the dreſſings ought to be removed only once in two days; the bandage, by which they are retained, being alſo kept ſomewhat more tight, that the luxuriancy of the granulations may be reſtrained, and the

new flesh become more compact and firm. As soon as the granulations are risen to an equal height with the neighbouring parts, the ointment is to be spread thinner, so that it may only just cover the cloth, which will effectually keep the granulations from becoming too luxuriant, or check them if they are so already. Thus, the cicatrix will commonly be formed in a short time; but, if it should not, we may apply a little dry scraped lint over the surface of the sore, keeping it on with a slight compress, and a roller over all. Should this still prove ineffectual, we may apply to the wound a bit of rag, dipped in tincture of benzoin, which will in general produce a cicatrix in one or two days. Sometimes I have seen a wound cicatrized, by keeping it covered with pledgets, spread with ceratum a lapide calaminari, for a few days. Goulard's cerate has been highly extolled for this purpose; and, indeed, it must be serviceable, as far as it removes inflammation, and promotes suppuration; but I am well assured that it will by no means prove effectual in all cases; having often seen a cicatrix produced, by washing the wound with lime-water, or with ardent spirits, when all other means had failed.

The thickness, as well as frequency of our dressings, must be proportioned to the size of the wound, and the quantity of matter discharged.

ged. Thus, if the wound be ſo large that it cannot be brought together, it muſt be dreſſed with a large pledget, both to keep out the air, and to aſſiſt in the formation of matter upon the ſurface. Over this, we muſt next apply a compreſs of tow to keep the part moderately warm, and to abſorb the matter, if plentifully formed. Two or three folds of linen are to be put over all; the whole being retained by a bandage of linen or flannel. Thus, the wound is to be dreſſed as often as is judged neceſſary, taking care to do it always as expeditiouſly as we can, for nothing is more injurious to wounds than the acceſs of air; and the longer they are expoſed to it, the worſe they are. The great object to be attained by dreſſing wounds, indeed, is to exclude the air from them; whence it is evident that they ought to be dreſſed as ſeldom as poſſible, only for cleanlineſs, and to prevent acrimony in the matter.

In healthy patients the cure generally goes on regularly, and the wound gradually contracts, until at laſt a cicatrix is completely formed. Where the granulations prove too luxuriant, they may either be deſtroyed by cauſtic, or by a little powdered Roman vitriol; or, in ſome caſes, by means of a pledget of dry lint, and over this a compreſs of linen a little larger than the wound, with a pretty firm bandage over all.

Where

Where wounds are not attended with any uncommon ſymptoms, they will, for the moſt part, be eaſily cured, by the method juſt now laid down; but, as all of them have a tendency to ſwell and inflame, great care ought to be taken from the very firſt to prevent any appearance of inflammatory ſymptoms, by the application of leeches round the edges of the wound, by bloodletting, &c. The regimen, during this time, muſt be of the antiphlogiſtic kind; and, as in general, the pain, ſwelling, and tenſion abate, as ſoon as a free ſuppuration takes place; this ought alſo to be encouraged as much as poſſible, by the means already mentioned. When the inflammation has abated, we may then give opiates in moderate doſes pretty freely, and frequently repeated. By this method, we may always with certainty produce ſuppuration, and reduce the wound to the ſtate of a ſimple ulcer, to be cured by the method already directed, viz. by dreſſings with mild ointments, &c. Sometimes, however, wounds will occur, attended with the moſt acute pain, tenſion, and burning heat, without any ſymptoms of proper inflammation. In ſuch caſes, there is but very little ſwelling for the firſt forty-ſix hours; nay, ſometimes, for ſeveral days after the wound has been inflicted. Inſtead of this, the parts about the wound are flaccid; or, if any ſwelling takes place, the ſkin has a kind

kind of yellowiſh hue, while the other ſymptoms are augmented almoſt to an intolerable degree. Theſe are the ſymptoms of a wounded nerve; and, it is evident, that they cannot be the conſequence of inflammation, becauſe inflammations are always attended with a red colour in the parts; but here they are flaccid, pale, or yellowiſh. As the cutaneous nerves only are generally wounded, we ought without delay to divide them by the knife, when we find ſuch ſymptoms as thoſe above deſcribed taking place. This is much preferable to the method directed, by the ancient phyſicians and ſurgeons, of dropping into the wound ſome hot or cauſtic liquor, by which the nerve might be deſtroyed, ſuch as oil of turpentine, oil of vitriol, &c. When this operation is to be performed, the patient's limb muſt be firmly ſecured by an aſſiſtant; and the ſurgeon, inſtead of opening the wound, and endeavouring to find out the nerve, a practice which modern ſurgeons have moſt abſurdly recommended, muſt make a new diviſion about half an inch above the wound, and extending as far on each ſide of it; or, if the wound be large, the inciſion muſt always extend one or two inches beyond it on each ſide. It muſt likewiſe penetrate through the ſkin, cellular ſubſtance, and aponeuroſis of the muſcles, to the depth of the other wound, or a little more. It would, however, be very

very abſurd, as well as cruel, to go much deeper, on the ſuppoſition of a nerve being wounded; for, in nine caſes out of ten, I may ſay it will be found that the cutaneous nerves only ſuffer; and, therefore, by dividing (which, in the method I have recommended, he will always certainly do) every cutaneous nerve, and every branch of theſe nerves, as well as every membraneous expanſion, avoiding only the large veins and arteries, the patient will inſtantly be relieved. Indeed the ſymptoms attending the wound of a nerve are of ſuch a peculiar nature, that there are inſtances of patients of their own accord deſiring the performance of the operation, and pointing out where it ought to be done. After the operation, he muſt bring the lips of both wounds as nearly into contact as poſſible, (which may always be done with that laſt made), and ſecured according to the directions already given.

Beſides thoſe wounds in which the nerves are injured, there are others in which the patient is affected with deep ſeated and pungent pain, pulſation in the part, and other diſagreeable ſymptoms. This takes place in punctures by needles or pins in the ends of the fingers, from bruiſes along the courſe of the tibia, or by other injuries in which the perioſteum is bruiſed and expoſed to the air. In the firſt of theſe caſes, viz. where the ends of the fingers are punctured, or the perioſteum

oſteum of the tibia injured, a ſmall tumor ariſes as it were from the bone; and the remedy is, to divide this tumor with a lancet, much in the ſame manner as is practiſed in blood-letting. The lancet ſhould be puſhed through the ſkin, cellular ſubſtance, and fleſhy parts, until it be felt diſtinctly to touch the bone; after which, an inciſion is to be made through the whole extent of the tumor, making its point touch the bone throughout the whole length. Thus, free vent will be given to any matter which may be depoſited within the perioſteum or on the bone; and, by ſcarifying the perioſteum itſelf, any tenſion which has taken place there may be removed. When the perioſteum happens to be inflamed at the bottom of a large wound, ſo that we have reaſon to believe the pain and other diſagreeable ſymptoms to proceed from this cauſe, we muſt make our ſcarifications with the ſcalpel ſo large and deep, that we may fully divide the inflamed part of the membrane through its whole extent. Thus, I know, from repeated trials, that, in all theſe ways, inſtant relief will be given to the patient, without the leaſt injury being done to the perioſteum, by dividing it; for, as ſoon as the parts are covered up from the air, the wound fills up from the bottom, and no ſuppuration between the perioſteum and bone can or does take place.

In

In ſome caſes which have fallen under my obſervation, both in paronychia, and in bruiſes of the tibia, where matter was formed, a cure was performed, by letting it out with the point of a lancet as already directed, and preventing the acceſs of the air, by covering up the wound immediately with a pledget ſpread with healing ointment. In other caſes, after the wound has begun to granulate, and the cure has for ſome time gone on proſperouſly, the patient comes to be affected with great pain in the wounded part, but only of a ſuperficial nature, not deeply ſeated in the former caſe. It is, however, frequently attended with a burning heat, and great irritability of the nerves, not only in that part, but through the whole body; the patient is deprived of reſt; and, if ſomething is not done ſpeedily to abate theſe ſymptoms, the whole ſurface of the wound becomes foul; and ſuch a virulent diſcharge takes place, as firſt excoriates the neighbouring parts, and then converts them into an ulcer of the ſame kind. Here, emollient poultices are prejudicial, by increaſing the debility and irritability of the parts. To abate the pain and take off the irritation, we may apply an ointment compoſed of a drachm of opium, diſſolved in half an ounce of fine oil olive, and afterwards rubbed well upon a tile, with an ounce and an half of unguentum ſimplex. A

piece

piece of linen, ſufficient to cover the ſore, muſt be ſpread with this ointment, and applied to the ſore, renewing it every twelve hours; putting over it a poultice of the tendereſt leaves of hemlock, recently gathered, and beat in a mortar to a pulp, adding to it half an ounce or an ounce of the beſt wine vinegar. A large doſe of opium ought alſo to be exhibited, night and morning, until the ſymptoms are removed, waſhing the ſore all the while, once a day, with a weak ſolution of ſugar of lead; and taking care to avoid coſtiveneſs throughout the whole of the cure, at leaſt while the opiates are uſed. The belly ought to be kept open, however, rather by laxative clyſters, than by purgatives of any kind. One free diſcharge is always ſufficient; more would be attended with an increaſe of the irritability. Thus, the more ſevere ſymptoms will be taken off, and the ſore again put on an healthy appearance; after which, we are to complete the cure with ſimple dreſſings.

Beſides the ſymptoms of pain, inflammation, and tenſion, of which we have already treated, wounds are ſometimes attended with others ſtill worſe. One of theſe is, called by practitioners, *ſubſultus tendinum*, and manifeſt themſelves by ſpaſmodic ſtarts of a particular kind, by which the wounded limb is ſometimes raiſed from the bed. If this ſymptom be not relieved, it gene-

rally increaſes, ſo that the patient becomes very uneaſy, and ſuffers much pain, by the diſtraction of the parts of the wound from one another; nay, the veſſels which have been tied up may be burſt open, and new hæmorrhages unexpectedly enſue. In caſes of this kind, we muſt firſt put the limb into as favourable a poſture as we can; a large doſe of opium is to be given, and repeated as ſoon as the effects of the former are gone off. The opiates are to be continued till the ſtartings are relieved. It is, however, only in amputations where theſe ſymptoms moſt commonly take place, and that immediately after the firſt dreſſing; and, that too in caſes where, inſtead of bringing the ſides of the divided muſcles and ſkin exactly together, and ſecuring them, ſo that they may heal by the firſt intention, a great ſurface of wound has been left expoſed. The reaſon is obvious. The firſt dreſſings uſed by almoſt every ſurgeon, both in amputations, and in wounds of other kinds, is dry caddice or charpee, by which the wounded fibres are irritated to ſuch a degree that the ſubſultus comes on. By a continuance of this irritation, the wounded parts become every moment more and more ſenſible, and the ſubſultus increaſes, unleſs relieved by opiates, until the dreſſings are thoroughly moiſtened by the ſerous effuſion that takes place, and the part of them next the tender veſſels

veſſels lubricated, ſo that the dreſſings cannot any longer irritate them. When this is done, the ſubſultus would, even without opium, entirely ſubſide, but would come on again as ſoon as the dry dreſſings were renewed, though they would then be leſs ſevere, and of ſhorter duration than before, becauſe the matter would now be formed in larger quantity than before, and ſooner lubricate the dreſſings. I know from repeated experience that this is a fact; and that when, inſtead of this method, we follow the proper one of uniting the fleſh and ſkin together, where only the ſmall openings neceſſary for extracting the ligatures are left, no ſubſultus ever follows. In upwards of fifty caſes of amputation, where the wound has been completely healed in ſixteen or twenty days, the patient never once had a convulſive ſtart; and moſt of them had not even occaſion for a ſingle doſe of opium. Hence, it is evident that all dry dreſſings ſhould be laid aſide when the wound is of any conſiderable extent; for the very ſame ſymptoms take place in large wounds, though there be no amputation. In all caſes, as I have repeatedly mentioned, the ſides of the wound ought to be brought together, if not completely, at leaſt as near as we can. The wound is then to be covered with a plaſter compoſed of the ſimple liniment of the Edinburgh Pharmacopeia, by which all the ends of the wounded

wounded veſſels and nerves will be protected from the roughneſs of the dreſſings. Thus, we may always be aſſured that no diſagreeable ſymptoms will take place, and the cure will go on ſmoothly, and without danger to the patient.

Sometimes the ſymptoms attending not only amputations, but large wounds of every kind, are ſo grievous, as to bring on that dreadful diſorder called a *tetanus*; and there are inſtances of patients dying in this way on the third day after the operation. This, however, only happens, when, through the unſkilfulneſs of the ſurgeon, the nerve has been tied up with the artery in ſecuring the wounded veſſel. The ligature muſt, on the firſt appearance of this terrible ſymptom, be inſtantly cut, and the veſſel tied up anew, by means of the tenaculum, without the nerve. Symptoms of this kind, however, frequently occur from very ſlight wounds of the lacerated kind, but that chiefly in warm climates, though ſometimes they alſo occur in temperate countries. Convulſive ſymptoms, of which the tetanus is the worſt, do not come on in any country merely by the heat, but by expoſure to cold, after the patient has been much heated; and, in very warm climates, the tetanus frequently comes on without any external wound at all. The reaſon is, that, in theſe climates, though the day be very warm, the nights are very cold and damp,

damp, on account of the great quantity of vapour raiſed by the heat of the ſun. As, therefore, the ſame ſymptoms may be induced, either by expoſure to the night air alone, or by punctures or lacerated wounds, the cure muſt in both caſes be pretty ſimilar. When the tetanus ariſes from cold alone, it takes place immediately, or within a few days after the patient has been expoſed to it; but, when from an injury done to a nerve, it often does not make its appearance till a conſiderable time after, and the wounded part has become quite free of pain and uneaſineſs, there are even inſtances of its not coming on till after the wound has been quite cured. Theſe inſtances, however, are very rare; and, when they do happen, I am apt to think that they muſt be occaſioned rather by the application of cold, than any injury done to the nerve, which muſt undoubtedly ceaſe to ſuffer as ſoon as the wound is cicatrized.

The ſigns of an approaching tetanus from wounds or lacerations of the nerves, are a burning heat is felt in the wound on the ſecond day, attended at times with ſlight ſpaſmodic or crampy pains in the affected limb. Theſe increaſe by degrees, and a ſtiffneſs comes on in the back part of the neck, gradually increaſing, till the motion is rendered very difficult, and exceſſively painful to the patient. Along with this, a ſenſe of

of uneaſineſs and pain is felt along the fauces, and top of the glottis, which ſoon brings on a difficulty of deglutition, and terminates at laſt in a total interruption of it. This rigidity and pain continues conſtantly to increaſe with rapidity, until at laſt the patient is ſeized with a violent pain at the bottom of the ſternum, ſhooting from thence to the back, and which ſeems evidently to be an affection of the diaphragm. As ſoon as this takes place, all the muſcles of the neck, but chiefly thoſe ſituated in the back part of it, are ſtrongly affected with ſpaſm, by which the head and ſhoulders are drawn back with excruciating pain; while the temporal and maſſater muſcles are ſo violently affected, as well as all thoſe of the under jaw and throat, with a ſpaſmodic contraction, that the teeth are ſo firmly preſſed together that we cannot open them by any force we can apply. When this has continued for ſome time, all the ſymptoms go off, and the patient continues apparently well, until another paroxyſm comes on. The pain of the ſternum, however, now returns very frequently, and brings along with it all the reſt of the ſpaſmodic ſymptoms; but, as the diſeaſe continues to increaſe, a greater number of muſcles are brought into action, until at laſt all the muſcles of the body, whether flexors or extenſors, ſtraight or oblique, are affected with the moſt violent ſpaſms. By the

the action of the abdominal muſcles, the belly is retracted, and becomes as hard as a board; the tongue retains its mobility for a long time, but at laſt comes to be affected as well as the reſt of the body; and, when it is ſo, it is often thruſt out of the mouth, and in danger of being bit through by the violence of the ſpaſms which affect the jaw. When the diſeaſe is at its height, every organ of voluntary motion is affected with theſe horrible ſpaſms; which continuing ſtill to increaſe, along with the exquiſite pain which always attends them, an univerſal convulſion at laſt puts an end to the patient's life. We may judge of the pain felt by the miſerable patients who are attacked by this diſeaſe, from what we ourſelves ſuffer from a ſpaſmodic affection in the muſcles of any particular limb, the leg, for inſtance. In this caſe, the moſt ſpeedy method of relief is the application of cold to the ſoles of the feet, as by getting out of bed and ſtanding on the cold hearth; and, from two caſes of tetanus which fell under my care, and which ſhall be afterwards mentioned, it appears that the diſeaſe in queſtion is occaſioned by debility; and, conſequently, that the cure, if any ſuch can be found out, muſt be effected by tonics. This is conformable to the maxim, *atonia gignit ſpaſmos*, which, in fact, is as old as phyſic itſelf.

When

When a patient is affected with tetanus, the ſpaſms, as we have ſaid, do not continue conſtantly; otherwiſe the pain attending them muſt bring on death in a very ſhort time. At firſt, after having laſted ſome minutes, they go off, and will not return in leſs than an hour, unleſs the patient makes ſome exertion. Motion of any kind, indeed, will certainly bring them on before they would otherwiſe make their attack; and, therefore, a fit will frequently come on when the patient attempts to change his poſture, or when he tries to ſwallow or ſpeak. It is ſeldom, however, that he has any fever, though, when the ſpaſms are very violent, the pulſe is often contracted, hurried, and irregular; and reſpiration is likewiſe affected in the ſame manner, though the heat of the body is not increaſed. The face, legs, and arms, are much ſhrunk in ſize; they are cold, and, for the moſt part, covered with cold ſweat; but, when the ſpaſms continue very violent, the pulſe is ſometimes more frequent and full than in a natural ſtate.

I have ſaid, that, in the intervals of the fits, the patient appears quite well*; but this is to be underſtood only of his being free from the violent

* I was ſome years ago informed, by one who had ſeen a patient in the tetanus, that, in the intervals, he ſeemed as well as ever he was in his life; that he tried to prevent the return of the fits by amuſement, particularly playing

lent pain, for the ſpaſm is never ſo totally gone that the antagoniſt muſcles can act. The ſenſorium commune, however, is ſeldom or never affected; no delirium, or even confuſion of thought, ever taking place, until the very laſt ſtage of it. The natural functions of the body, viz. appetite, digeſtion, and the ſecretion of urine, are little or nothing impaired; and if, at any time, the belly ſhould prove coſtive, it is to be attributed more to the quantity of laudanum or opium given to alleviate the violence of the ſymptoms, than to the diſeaſe itſelf.

The tetanus generally proves fatal, whether brought on by a wound, or whether it comes on by itſelf, notwithſtanding the uſe of the moſt powerful remedies hitherto known. Laudanum has been given in immenſe doſes, and even opium itſelf in the doſe of a ſcruple or more at a time; but, though ſome few have recovered by ſuch treatment, far the greater number have died; and a recovery from a locked jaw has always been accounted ſuch a rare occurrence, as to merit an inſertion in the memoirs of any learned ſociety. It is, however, evident to me, from every ſymptom which has been enumerated,

 that

at cards; but every thing proved ineffectual, the ſpaſms always returning with increaſed violence until he died. I forgot to aſk, whether in theſe intervals the ſpaſm of the jaw was relaxed?

that the diſeaſe is entirely the conſequence of a very debilitated habit of body. The ſtate of the pulſe, and coldneſs of the extremities, (though they appear warm to a byſtander), confirm this opinion. It likewiſe appears from the goodneſs of the appetite, which remaining unempaired under ſuch violent commotions, evidently ſhows that the body craves much ſupport. The moſt convincing proof of this, however, may be drawn from the texture of the blood itſelf; for, when any is drawn from a patient in the tetanus, it not only has no inflammatory cruſt, but is of a looſe conſiſtence, and does not coagulate in the uſual manner. If this be the caſe, it is impoſſible that opium, even in the largeſt quantities, mercurial medicines, or bliſters, can be of any ſervice. The firſt thing we have to conſider for the cure of tetanus, is how the debility or relaxation which takes place in it can be brought on. This we can eaſily ſee, in the firſt inſtance, proceeds from heat, which, of itſelf, will bring on a great degree of relaxation. Cold, indeed, ſeems to be neceſſary to produce the diſeaſe; and cold is ſaid to be a tonic. But cold acts as a tonic only when it is ſuddenly applied, as in the cold bath. It then drives the heat ſuddenly from the ſurface to the internal parts of the body; and thus, the heart and arteries receiving an additional ſtimulus, increaſes the circulation, and, conſequently,

fequently, the vigour of the whole body. The cafe, however, is quite different, when one is expofed to a cold damp night. The firft effect of this, is to check perfpiration, which, when fuddenly done, is always attended with ill confequences. The body then being continually kept covered with a very thin coating of water, let fall upon it from the night air, parts with its heat to raife the water in vapour. Thus, it is itfelf cooled to a great degree, for nothing produces cold more powerfully or fuddenly than evaporation; and every one muft have, at fome time or other, been fenfible of the great tendency which expofure to damps has to bring on pains in the part which has been expofed to it. I do not, however, pretend to explain why the mufcles of the upper part of the body are fo foon affected in this manner, unlefs it be that the exciting caufe exerts itfelf by means of the blood or nerves upon the brain, from whence all the nerves derive their fource; and, confequently, thofe parts neareft to it are fooneft affected. But, be that as it will, it is evident, from the caufes by which tetanus is produced, that the remedies commonly exhibited in fuch cafes never can do any good, though it is certain that they may do harm. The warm bath, which is one of the principal of them, can have no effect but when the perfon is in the water. After he comes

comes out of it, ſuch an evaporation takes place, that the body, inſtead of feeling warm, feels cold; and thus, in caſes of tetanus, the cauſe of the diſeaſe muſt be increaſed. Opium, indeed, in many caſes, acts as a ſtimulant; but all medicines of this nature, by rarefying the blood and diſtending the veſſels, during the time of their action, produce a proportionable degree of debility, and collapſe after their action has ceaſed, and thus muſt likewiſe contribute to render matters worſe. Mercurials, which always tend to diſſolve the blood, muſt evidently be improper in a diſeaſe where the blood is already too thin and diſſolved; and, as for bliſters, we can expect little good from them, or any acrid application, where the habit is already irritable beyond meaſure.

In treating of the proper cure of this diſeaſe, however, I muſt own myſelf conſiderably at a loſs. It hath ſo long been accounted abſolutely mortal, and the inſtances of recovery are as yet ſo very rare, that we may indeed ſay, with propriety, that the cure is not yet diſcovered; but, when we come to conſider, in a manner, *a priori*, how we are to proceed, the taſk muſt be exceedingly difficult, and the event precarious. In the preſent inſtance, we can derive little benefit from analogy; for all the diſeaſes with which this has any affinity, are almoſt equally incurable

ble with itſelf. That which ſeems moſt of all to reſemble it, is the hydrophobia; and Dr Ruſh of Philadelphia has publiſhed a treatiſe, in which the analogy between theſe two diſeaſes is particularly pointed out; but the cure of hydrophobia is ſtill leſs known than that of tetanus. Violent hyſteric affections ſometimes put on the appearance of both diſeaſes; and here I cannot help relating a moſt extraordinary fact, which I had from a perſon on whoſe veracity I can depend. A young woman was ſeized with ſuch violent hyſteric fits, as threw her into convulſions, reſembling thoſe of the tetanus or opiſthotonos, inſomuch that the ſpine was recurvated as in thoſe patients, and could not be ſtraightened by any force that could be applied. The ſpaſms reſiſted the moſt powerful remedies that could be given, as laudanum, æther, &c. exhibited in very large doſes. Mercurial frictions were alſo uſed without ſucceſs; but, at laſt, a quack being employed, when her friends perceived that regular phyſicians could do no good, cured her in the following manner, no leſs extraordinary than the diſeaſe itſelf. Having blown out a candle which had been well lighted, he thruſt the wick, while red and ſmoaking, into her noſtril; then running to a tea kettle of water which he had made to boil, and kept boiling on the fire, he poured out about a wine glaſsful of it, and running

ning back to the patient as quick as poſſible, that the water might not loſe its heat, poured it down her throat. The operation of theſe two *Herculean* remedies was inſtantaneous. She recovered in a moment from that fit, and ſoon got free from the diſeaſe altogether. The phyſician who attended this patient did not ſee this remedy applied, but had the account from her friends; and the relation is ſo extraordinary, that we can ſcarce ſuppoſe that they could have invented it. If I may be allowed to reaſon, from an account ſo marvellous, it muſt have been the violent ſhock, without any evacuation given to the nervous ſyſtem, which inſtantly recalled, as it were, the natural powers to their duty, and made them deſiſt from theſe irregular motions, which, when once begun, continue and increaſe themſelves, by gradually throwing more and more of the nervous fluid out of its proper mode of action. Here, indeed, I cannot help remarking, that, if we may adopt the theory of thoſe who ſuppoſe the nervous and electric fluids to be the ſame, we may alſo reaſonably believe, that, when once this fluid is thrown into very violent motions within the body, theſe may be kept up and augmented by the action of the fluid without; and, conſequently, internal remedies of any kind can ſcarce have any effect. Something of this kind, indeed, would appear to be the caſe, both in tetanus

tanus and hydrophobia, from the extreme inſenſibility of the body in both diſeaſes to the moſt powerful remedies. In the Medical Commentaries, we have an account of a negro whom the tetanus attacked, after catching cold in the night time, the uſual mode in which it comes on. The cure was effected by opium; but in ſuch quantities, that, in ſeventeen days, he took no leſs than 1500 grains of it, which is at the rate of eighty-eight grains per day. In the ſame work, we are told of a boy of ten years of age who took laudanum to the amount, at leaſt, of ſixty drops ſix times a-day. In the Medical Obſervations, one patient took ten grains a-day of ſolid opium, by which the ſpaſms ſeemed only to be kept from increaſing; but the cure ſeemed to be effected by amputating her finger; and, had not this been done, it is probable that the quantity of opium muſt have been greatly increaſed. In another, in whom the diſeaſe made its attack ſpontaneouſly, the quantity of laudanum at firſt was but ſmall, only ten drops every two hours, which were afterwards augmented to twenty; yet, in this way, ſhe took 420 drops in five days; and there was beſides a plaſter made of opium and galbanum applied to the pit of the ſtomach, which appears to have had a good effect; her neck and throat being likewiſe embrocated with anodyne balſam. All this, however, proving inſufficient,

insufficient, the laudanum was increased to thirty drops every two hours; and thus she took 180 drops in twenty-four hours, by which the violence of the disease seems to have been subdued. A third patient took a grain of solid opium every hour for several days together, without getting more sleep than usual, and with only a temporary relief of the symptoms. Here the cure was evidently effected, by amputating the last phalanx of one of the fingers, the bone of which was carious. This patient took about 317 grains of opium in five weeks. The fourth, a soldier, whose arm was shattered, at the articulation, by a cannon-shot, took, for some time, half an ounce of laudanum, or 480 drops, per day; then a grain and an half of opium every four hours, which was afterwards augmented to twelve grains a-day. This still proving insufficient, he had an ounce of tinctura thebaica, and at last sixty grains of opium daily. The case of this patient was selected from thirteen others, nine of whom died; and nine (we are not told whether they were the nine who died or not) remained a whole night exposed to the air in open boats. Two others, who had the locked jaw without any wound, died, though they took large doses (we do not know how much) of opium. A fifth patient took, for three weeks, at a medium, fourteen grains of opium a-day,

(ſometimes he took twenty), without producing the leaſt ſtupor, affecting his head, or obſtructing his reſpiration; "and, ſays the narrator of the caſe, I had no reaſon to think but that the quantity might ſtill have been increaſed with ſafety, and the cure perhaps, thereby, conſiderably expedited."

Thus far, we ſee the good effects of opium; but, were we in poſſeſſion of the numerous caſes which have proved fatal, we might perhaps ſee that it is not any ſpecific in the diſeaſe. It is, however, very much to be regretted that theſe caſes are not publiſhed, as then we might learn from the various quantities of laudanum or opium exhibited to the patients, what is the doſe with which we might begin with any hope of doing good; for, the misfortune is, that there is no time to delay, for the diſeaſe increaſes with ſuch rapidity, that the loſs of a ſingle hour is a matter of great conſequence. The leaſt quantity of opium taken by any of the patients, whoſe caſes are related in the Medical Obſervations, was ninety grains in twenty-two days, or about four grains a-day. It might, therefore, be a good rule to begin with twice the doſe, which the patient could be ſuppoſed to bear when in health, to obſerve whether it has any effect; and, if it has none in the time uſually allowed, to give another one half larger. It is, however,

much to be lamented that we have not any certain criterion, whereby to judge of the ſtrength of the diſeaſe; for, in proportion to this, the patient will require a larger quantity of opium. One circumſtance, which may perhaps throw ſome light on this part of the ſubject, I had from a phyſician who attended four or five patients in the tetanus, all of whom died, except one, in ſpite of very large doſes of opium and other very powerful medicines. One of theſe patients, whoſe leg had been bruiſed by a bullock, had a deep wound made above the bruiſe, with a view to cut off the communication between that and the upper part of the body. While this was doing, he made no complaint of pain; neither did the wound bleed, as one might have expected. In the tetanus, therefore, it ſeems the ſkin and outer parts of the body are in a great meaſure deſtitute of ſenſibility; and, when they are ſo, we may reaſonably conclude that the internal parts are ſo likewiſe; and, hence, we may account for the exceſſive doſes of opium taken without effect in this diſeaſe. The degree of this inſenſibility of the ſkin therefore, if it is a conſtant ſymptom, would be an indication of the ſtrength of the diſeaſe, and might point out to us the quantity of opium which the patient required for his relief. In a treatiſe by Dr Chalmers on this diſeaſe, publiſhed in the firſt volume of

of the Medical Obſervations, he divides it into three ſtages. In the firſt, the patient feels ſome kind of general laſſitude, and an uneaſy ſtiffneſs, rather than pain, about his jaws; his neck alſo becomes ſtiff, and he feels at times the pain under the cartilago enſiformis. He alſo has the ſpaſms along the ſpine, and retraction of the head. This continues from a few hours to three or four days; and, in proportion to the violence of the firſt attack, is the danger of the patient. In the ſecond ſtage, the ſpaſm under the ſternum returns every ten or fifteen minutes, with an increaſe of all the other ſymptoms; and the third ſtage exhibits a moſt melancholy ſcene of almoſt inceſſant torment, ſpaſms, and convulſions. From theſe different appearances, we may learn how far the diſeaſe has advanced, but cannot abſolutely determine how far the powers of life are exhauſted at the moment the phyſician or ſurgeon is called; and, the more they are exhauſted, the greater quantity of opium ought to be exhibited. Let us now ſee what may be expected from other remedies.

In the firſt caſe, related in the Medical Obſervations, no internal medicines would ſeemingly have been uſeful, had not the finger been amputated; and the ſame might be inferred from the third caſe; but, that amputation alone will not cure the tetanus is certain, as in one of the

caſes

caſes treated by the phyſician above-mentioned, the finger was amputated the day after the ſpaſms came on; but he was obſtinate, and would take no medicines; ſo he died the ſame day. It muſt be remarked, however, that this patient was greatly relieved for a ſhort time after the operation; which ſhows that the nervous fluid, like that of electricity, when once ſet in motion, does not ceaſe its motions at once, though the exciting cauſe be removed. Dr Prieſtly obſerves, that an electrical battery, though once diſcharged, will, in a little time, become partly charged a ſecond time; nay, he tells us, that he has received ſuch ſhocks, *as he would not wiſh to receive again*, from batteries, which he had three times cleared of theſe ſpontaneous charges. Suppoſing, therefore, the nervous and electric fluid to be the ſame, if the motions of it within the body become ſo violent that they affect part of that which is without the body, the removal of the exciting cauſe can do very little towards the accompliſhment of a cure.

The good effects of making an inciſion above a wound, where a nerve happens to be partially divided, have been already taken notice of. There are many inſtances where, by inciſions of this kind, a locked jaw has in all probability been prevented from coming on. In both tetanus and hydrophobia, the ſymptoms are ſomewhat ſimi-

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lar to thoſe from a nerve partially divided; for a pain from the wounded part ſtrikes up along the courſe of the nerve, and from thence affects all the nerves and muſcles of the body. In both caſes, there ſeems to be a double inflammation of the wound; and, when this ſecond inflammation takes place, this darting pain begins. As ſoon, therefore, as it is felt, the inciſion ought to be made; and, if done when the ſymptom is only beginning, bids fair to be very uſeful. When the diſeaſe has fairly come on, however, it plainly cannot be depended upon; for, in all caſes, this muſt be deemed inferior to amputation. In the patient above-mentioned, who had the tetanus in conſequence of a bruiſe in his leg, the inciſion was tried, and it did give ſome relief for a little time; but the diſeaſe had proceeded too far to be ſubdued. Had it been done ſooner, perhaps it might have been more uſeful; but, unfortunately, in this diſeaſe, as well as the hydrophobia, aſſiſtance is ſeldom called for, until the diſeaſe is thoroughly formed, and then *preventatives* can be of little avail; though, even then, what could have prevented the diſeaſe muſt always have ſome effect, and therefore ought never to be neglected.

If this diſeaſe be accompanied with an inſenſibility of the outward and inward parts of the body, then any thing which acts as a violent ſtimulus,

mulus, without producing any evacuation, ought to be uſeful. The moſt violent of all theſe is actual fire; and, in the hyſteric caſe mentioned, this was ſucceſsfully uſed by the quack. There are few, however, I believe, who would be willing to repeat this experiment; but it might be tried what could be done by other more innocent, though powerful ſtimuli. The principal of theſe are alkalies, fixed and volatile; ardent ſpirits, ſpices, &c. From the chemical properties of fixed alkali, we know, that, when taken internally in a large doſe, it muſt make a very remarkable change on the contents of it, whatever they are. If a quantity of fixed alkali be mixed with blood, fleſh, urine, &c. it will decompoſe it, and extract a volatile alkali. Mixed with the gaſtric juice of the ſtomach, it muſt undoubtedly have the ſame effect; and, therefore, if any morbid matter is in the ſtomach, which in the hydrophobia certainly there is, and probably alſo in the tetanus, its nature muſt be changed, in proportion to the quantity of alkali ſwallowed. Dr Chalmers informs us that he cured a very young infant, by purging with an infuſion of rhubarb, to which a few grains of muſk, and a little *ol. tart. per deliq.* were added, together with the warm bath, and the frequent injection of glyſters made with an infuſion of chamomile flowers; to each of which, a ſmall portion

portion of Caſtile ſoap was added. This is the only caſe I remember to have read where the fixed alkali was uſed; and it doth not appear, that, in the tetanus, any trial has been made of the volatile alkali. From analogy, however, we have good reaſon to ſuppoſe that it would be uſeful. It certainly counteracts the deadly effects of laurel water, as is evident from an experiment of Dr Mead. That phyſician having given a doſe of this pernicious fluid to a dog, the animal almoſt inſtantly fell down, and appeared to be in the agonies of death. On pouring down his throat, however, a ſmall quantity of very ſtrong ſpirit of ſal-ammoniac, and holding ſome of it to his noſe, he very ſoon began to ſhow ſigns of life, and in a little time became quite well. In France, the volatile alkali has been celebrated for its effects in the hydrophobia; and it is uſed by the Indians, both of Aſia and America, as a cure for the bite of ſerpents. If this remedy is to be applied, it ought to be of the very ſtrongeſt kind, ſuch as made with quicklime; for the mild concrete kind, being in a great meaſure neutralized by fixed air, affords a much weaker ſtimulus. In a healthy ſtate, one could ſcarce take it into their mouth undiluted, without danger of ſuffocation; but it may be otherwiſe, indeed it muſt be otherwiſe, when the vital powers are very low, and in a manner exhauſted;

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and it does not appear, that, in Dr Mead's experiment, the dog was hurt by pouring ſtrong ſpirit of ſal ammoniac down his throat. Dr Huxham mentions a gentleman who could eat volatile ſalts like ſweet meats; and I have been told of a lady in the North of Scotland who had accuſtomed herſelf ſo much to the uſe of volatile ſpirits, that ſhe would take a wine glaſsful of ſpirit of hartſhorn at once. Dr Huxham does not tell us what effect the volatile ſalts had upon the gentleman juſt after they were taken. On the lady, it had ſomething like the effect of laudanum. The ultimate conſequence in both was a diſſolution of the blood; and to this was attributed the fatal event of the ſmall-pox, with which this lady was ſeized. In the tetanus, however, the volatile alkali could not have time to produce any effect of this kind, the immediate ſtimulus being the only thing requiſite; and, therefore, it ought to be given not only in a very large quantity, but as much undiluted as poſſible.

Next to opium and volatile alkali, the moſt powerful ſtimulants are ardent ſpirits, eſpecially when mixed with ſpices. There is an inſtance of a perſon in an hydrophobia having drunk a bottle of brandy, and recovered of the diſeaſe. I have alſo had an account of a boy in the North of Scotland who was not only bit, but almoſt killed,

killed, by a mad dog, and who drunk a quart bottle full of gin at once, very ſoon after he received the injury. He never had the hydrophobia, though his intellects were affected at the new and full moon for many years afterwards. It is impoſſible to ſay, whether in the one caſe the hydrophobia was cured, or, in the other, prevented by ſuch an enormous doſe; but, as we are certain that ardent ſpirits act very powerfully upon the ſyſtem, it is impoſſible but we muſt conclude that ſuch doſes would have *ſome* effect, either in augmenting or leſſening a diſeaſe; and, if the patient recovers, we may ſuppoſe that it was leſſened by it. In one of the caſes of tetanus above related, viz. he who died the ſame day that the finger was amputated, ardent ſpirits had a partial trial. This man was by trade a coal porter, and got his hurt in a quarrel with one of his neighbours. The wretch, with whom he fought, bit one of his fingers; and, in conſequence of this, the tetanus came on. When he firſt found himſelf affected, he took a gill of whiſky mixed with pepper; and, by this, he found himſelf ſo far relieved that he continued his work all that day; but, as unluckily for himſelf, he would not take any medicine, nor, it appears, even repeat the ſame doſe, he died next day. In this caſe, the amputation of the finger, which took place next

day, muſt have accelerated his death, by ſtill farther exhauſting the vital powers, for the ſupport of which he refuſed to uſe any means. The other, who had the diſeaſe in conſequence of a bruiſe on his leg, drunk a conſiderable quantity of wine, and lived longer than the former; but, in caſes of ſuch extremity, wine appears to be too weak; and, if given at all, ought to be mixed with at leaſt an equal quantity of proof ſpirit.

Among this claſs of ſtimulants, we may reckon *muſk*, a medicine which has been long in uſe, but of which the virtues are by no means aſcertained. In the caſe of the wounded ſoldier, quoted from the Medical Obſervations, it was given moſt liberally. He firſt got ten grains of muſk along with one of opium, then eight ounces of julep a moſch. with half an ounce of laudanum; and, at laſt, *half an ounce* of muſk, with a drachm of opium daily. The patient recovered; but, as in this caſe, the muſk was given in ſuch enormous quantities, if we allow *one half* of the cure to be performed by the opium, we muſt likewiſe allow it to be a remedy four times better than the muſk; becauſe a drachm of it was equivalent to *four* of muſk, not to mention the great difference in point of price; for half an ounce of muſk a-day is an expence which many patients could not be at. To know, however,

ever, of what real benefit each of theſe medicines may be, we muſt have recourſe to other caſes. In the firſt of thoſe related in the Medical Obſervations, the patient was greatly relieved by nine grains of opium a-day; but, on leſſening the quantity, ſhe preſently became worſe, and was again relieved by augmenting the doſe. In another, the patient took ten grains of muſk every three or four hours for two days, with but a ſmall proportion of opium, and during this time evidently became worſe. The only effect which the muſk ſeemed to have, was to heat him greatly, ſo that cooling and diluting drinks became neceſſary. Opium was therefore employed by itſelf; and, on omitting it only for a ſingle night, he became evidently much worſe. On returning again to the uſe of this medicine, he became better, and finally recovered of the diſeaſe. Dr Chalmers tells us, that he had not tried muſk; but, *after the violence of the ſpaſms had been abated by opium*, he thinks it might be uſed *in large doſes* with good effect. In another patient, whoſe caſe is related in the Medical Obſervations, muſk, bark, camphire, and valerian, were given in large doſes without any effect. Amputation of the laſt joint of the finger, and large doſes of opium, effected a cure. In the ſame work, we are aſſured by Dr Farr, phyſician to the Royal Hoſpital at Plymouth, that he had tried

tried muſk in two caſes of locked jaw without any good effect, or *any effect at all*, but that of occaſioning a remarkably full pulſe. It does not appear, however, that this medicine is ſometimes efficacious in convulſive or ſpaſmodic caſes. In the ſame work, (the Medical Obſervations), we find a caſe related, which, while it proves the good effect of muſk, not a little confirms the conjecture above-mentioned, that the nervous fluid, when once thrown into motion, like that of electricity, continues its motions for a long time after the exciting cauſe is removed; nay, that the fluid which is without the body may be thrown into action, in ſuch a manner as to continue or augment the morbid diſpoſition without the body itſelf. The caſe alluded to was that of a young lady of ſeventeen, who having out of curioſity received a ſhock of electricity from a charged vial of eight ounces, felt, in about three hours after, two or three ſlight ſhocks of the ſame kind, only weaker than the former. Theſe ſhocks continued to be felt every day at uncertain intervals, though ſometimes a day intervened between any of them. In about two months from the time ſhe was electrified, the convulſions occaſioned by theſe ſhocks began to be perceptible to others; and, in a month after, ſhe was put under a courſe of antiſpaſmodic medicines. Theſe, however, along with the bark

bark and ſteel, were productive of no good effect; and the fits increaſed in ſuch a manner as to threaten the life of the patient, but at laſt were entirely removed by half a drachm of muſk taken every four hours for four days.

In this caſe, we have an account of a convulſive diſeaſe being brought on by electricity; but, in the ſame work, we have another in which a very dangerous convulſive diſorder was cured by it. This was in a girl of fourteen, who had moſt violent convulſive fits, returning almoſt every half hour, ſuppoſed to ariſe from her having imprudently expoſed herſelf to cold at the time the menſes appeared. This dreadful diſtemper continued for *ten years* in ſpite of every medicine that could be given, until the patient was quite wearied of her life. She was then electrified by Dr Franklin, who gave her four ſhocks morning and evening. At each ſhock, ſhe received the diſcharge of an *eight gallon* bottle. The firſt ſhock always brought on a fit, but the ſecond carried it off. This was conſtantly the caſe; but, notwithſtanding this, the diſeaſe gradually became more and more weakened; and, after three months electrification, diſappeared altogether. It would ſeem, therefore, that electricity might be tried with ſome hopes of ſucceſs in the tetanus, though as yet we have not any example of its being uſeful in that diſeaſe.

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It was tried in the girl who had the violent hyſterics above-mentioned, (and whom the quack is ſaid to have cured), but without ſucceſs. It was alſo tried in the caſe of that patient, in whom the tetanus was brought on by a bruiſe in the leg, but without ſucceſs. This medicine, if we call it one, ſeems indeed to be of a very precarious and equivocal nature. Some have found it extremely ſerviceable in a great many diſorders, while others have ſcarcely found the ſmalleſt benefit from it in any one. I am apt to think that the preſent caſe throws ſome light even upon this ſubject. The force of electricity neceſſary to accompliſh the cure of a violent convulſive diſeaſe, is here ſpecified, and it is prodigiouſly great. In the account given in the Medical Obſervation, it is ſaid to be, *two hundred ſtrokes of the wheel.* I do not well underſtand the expreſſion, but ſuppoſe it means that the wheel muſt be turned 200 times before the bottle could be charged. In the preſent mode of electrifying, I am ſure that no ſuch force is ever made uſe of. An eight gallon bottle or jar is never heard of; thoſe belonging to the machine in the Royal Infirmary here contain only about one gallon. It may indeed be objected, that electricity is much better underſtood than it was at the time that this cure took place, which was in the year 1752, and the electrical

electrical machines much more powerful, as well as neat and well made, than formerly. I grant that this is the case; but it will not from thence follow, that medical electricians keep their machines in better order for acting than formerly. I am afraid that the very reverse is the case. A very good machine, by only a very moderate degree of carelessness, will soon become less useful than a bad one which is well taken care of; and I am persuaded, that unless in the hands of professed electricians, it would be very difficult now to find a machine *capable* of charging an eight gallon bottle, and consequently must be incapable of curing any violent convulsive disorder. We may indeed from pint or quart bottles or jars produce very smart strokes, or loud snaps; but their real force, or power of operating upon the animal system, must be very much inferior to that of an eight gallon bottle. According to Dr Priestley, a very strong shock of electricity is less painful than a weak one; but there is this remarkable difference between them, that the strong shocks are felt through the whole body, while the weak ones affect only a particular part. To cure a disease, it is necessary that the shock affect the whole body; and hence a few strong shocks may effect what no number of weaker ones would be able to accomplish.

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In ſhort, with reſpect to electricity, we may ſay, as with reſpect to opium, or any other medicine which we mean to be of ſervice in caſes of tetanus, that it muſt be exhibited in much larger *doſes*, i. e. the power of it muſt be much greater than we would like to ſubmit to ourſelves, or to ſubject others in a ſtate of health. There are inſtances recorded where a palſy has been brought on by a ſtroke of lightning, and there are others of its being removed by the ſame. There is not the leaſt reaſon to ſuppoſe that the ſtroke which removed the paralytic affection was at all inferior to that which brought it on; and thus, in artificial electricity, if we mean to *do good* by it to a perſon in a violent diſeaſe, we have every reaſon to believe that the power employed may be as great as would *do harm* to one in health; and we certainly muſt think, that the charge of an eight gallon bottle, ſent through the body of a man in health eight times a day for three months, would do him hurt. As for the ſmall ſhocks uſually given, the ſparks drawn, and the electrical *aura*, which people in health can eaſily bear without any detriment, we may ſafely pronounce them to be inſignificant in diſeaſes of any conſequence; and the concurring teſtimony of moſt medical people evinces that they generally are ſo.

In Dr Chalmers's treatiſe on the tetanus, he gives his opinion, that all very heating and ſtimulating medicines, either given internally, or applied externally, are to be avoided; and, among theſe, he condemns the uſe of bliſters, as having *always* a moſt pernicious effect. "Mild purgatives, (ſays he), joined with temperate diaphoretics, have been given gradually, and continued, until they had operated without any advantage; nor did vomiting, which was excited accidentally by the karmes mineral, anſwer any good purpoſe, though much bile was thrown up; and worms have been voided both ways in others, without yielding any relief." The only thing, according to this author, which can be depended upon, beſides opium, is the warm bath; but I have already given my reaſons for thinking this remedy to be more likely to do harm than good. This remedy has been tried in the hydrophobia, but always without ſucceſs. It is moſt probable that this bath can do good only by its heat; and it certainly would be better to apply this heat in a dry way. When the body is very much exhauſted by diſeaſe and want of nouriſhment, it will abſorb a great quantity of the water into which it is plunged; but this is only equivalent to drinking as much of the liquid, and can increaſe the ſtrength no more. As to the idea of *relaxation* to be performed by

means of warm water, I cannot help thinking them very abſurd. We may *relax* a piece of hung beef, or dried fiſh, by ſteeping them in warm water; but the rigidity of theſe bodies is vaſtly different from a rigidity occaſioned by contractions of the nerves. Wrapping up the patient in flannel, by which the body accumulates its own heat, and of conſequence is invigorated, ſhould ſeem to be preferable. Neither are we to account the electrical effects of this ſubſtance as merely chimerical. Late experiments have ſhown, that animals are poſſeſſed of a particular kind of electricity; and, in the laſt volume of the Medical Commentaries, it is ſhown that convulſions may be induced, by wrapping up ſome of the trunks of the nerves of a frog in a conducting ſubſtance, and touching the toes with a finger. This confirms, in no ſmall degree, the hint I have already thrown out, that convulſive diſorders may be kept up by the fluid without the body. Were we ſure that this was the caſe, the cure would then be to cut off as much as poſſible the connection of the external electric fluid with the body, which could only be done by wrapping up the perſon in ſome electric ſubſtance, of which flannel is the cheapeſt and moſt convenient. Indeed, there are not wanting inſtances where nervous patients have found themſelves

themſelves conſiderably relieved by the uſe of flannel.

It is a great misfortnne that the origin of convulſive diſeaſes remain as yet in ſo much obſcurity. The frequent diſſections of the bodies of epileptic patients, where nothing amiſs could be diſcovered, ſhows that the cauſe is often ſought for in vain *within* the body. In the Medical Obſervations, Vol. 2d, p. 115, we have an account of a diſſection; and, it is the only one I remember, of a perſon who died of an epileptic fit. It was a boy of about ten years of age, who had fallen down in a fit, and was ſuffocated in the mud of a common ſewer. He had been afflicted with the diſeaſe for ten years, and felt the approach of the fits by a pain in the abdomen. On diſſection, the moſt remarkable appearances were, 1. The ſutures of the cranium were much more cloſe than is uſual in ſuch young ſubjects. 2. The *plexus choroeides* had a ſmall hydatide, like a piſtol bullet, adhering to it. 3. There was much leſs blood than uſual in the trunks of the vena cava *aſcendens* and *deſcendens*, and as well as in the right auricle and ventricle of the heart; and much more than uſual in the left ventricle, and in the aorta. This was directly the reverſe of what happens in other caſes of death, for in them the arteries are empty, and the veins full. This fulneſs of the arteries

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was not confined to the large trunks, but extended as far as could be obſerved to the ſmalleſt ramifications; and, as the large ſinuſes of the brain itſelf were quite empty, it is probable that the ſame kind of morbid affection extended to that part alſo, and was general throughout the body. Hence, the author of this account concludes, that, in an epileptic fit, this is the real ſtate of the arteries; and he ſays this opinion was confirmed by Dr Short, who informed him that he had known hæmorrhages fom the ſurface of the body, nay, even the left ventricle of the heart burſt, by the confinement of the blood in the arteries during the time of epileptic paroxyſms. The practical inference he draws from this, and it ſurely merits our attention, is, that, if blood-letting is to be uſed, it ought to be taken from arteries, and not from veins. Hence, he recommends arteriotoncy, or cupping with ſcarification, and likewiſe fricTions. In this caſe, and in all others ſimilar, we muſt, however, conſider the fulneſs of the arteries as the *effect*, not the *cauſe* of the diſeaſe. It is probable that the *cauſe* in this patient was the hydatide upon the plexus choroideus; and which, being inacceſſible, could not have been removed. This was extremely ſimilar to the conducting ſubſtance put upon the nerve of a frog, mentioned in the experiment; but,

but, though this ſhould be allowed, we can infer but little from it to aſſiſt us in the cure.

To put an end, however, to theſe ſpeculations, in which it may perhaps be thought I have indulged too far, I have already remarked, that, in all wounds productive of tetanus, they are abſolutely void of inflammation. The diſeaſe evidently proceeds from an high degree of debility prevalent in the ſyſtem; for which reaſon, we ought to do every thing in our power to produce an oppoſite affection. If we uſe bliſters at all, then it muſt only be as rubefacients; and, even with this view, they muſt appear to be very trifling remedies. With this view, they were uſed, though unſucceſsfully, in a caſe already related, in which a tetanus came on after a bruiſe in the leg; at any rate, however, we muſt never allow them to produce any evacuation of ſerum, or even to bliſter the ſkin. But, though it be proper, in order to cure this diſeaſe, that a phlogiſtic diatheſis be induced, yet it is certain that this may be overdone, and the patient thereby deſtroyed. Some caſes have been related where a cure was evidently affected by opium; yet, from the numbers who have ſuffered under this management, we may freely ſay, that the cures are only in the proportion of one to eight or nine. There are ſome caſes, related by authors, where the patients have indeed recover-

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ed from the tetanus, but have ſoon after been attacked by complaints in their ſtomach, which quickly put an end to their life. Upon opening their bodies, the ſtomach was always found in a high ſtate of inflammation, and ſometimes actually mortified. Notwithſtanding, therefore, it appears that the diſeaſe has ſometimes been cured by opiates, I am clearly of opinion, that, in caſes of tetanus, they ought almoſt to be entirely given up. The warm bath, I am likewiſe of opinion, ought not to be uſed; and, indeed, I muſt recommend a courſe almoſt directly oppoſite to that hitherto recommended and practiſed. Inſtead of putting the patient into a warm bath, I would plunge him into a tub of cold water, rendered ſtill colder by the addition of vinegar. This ought to be repeated as often as the patient could bear it; and, in the mean time, he ought to take the bark in very large doſes, not leſs than two ounces in twenty-four hours, waſhing down every doſe with a gill of port-wine. Thus, a degree of inflammatory diatheſis might be produced in the ſyſtem, without that danger of exciting a local inflammation and mortification in the ſtomach, which ariſes from immenſe doſes of opium. I am not, however, for rejecting opiates entirely. A large doſe may be given at firſt, and ſtill farther augmented, if the firſt has no effect to mitigate the ſymptoms, until we have an opportunity

tunity of puſhing the bark to its full extent. Beſides this, we ought to endeavour to excite a local inflammation in the wounded part itſelf, and to raiſe this inflammation as high as is conſiſtent with a reſolution afterwards. We certainly know, that nothing promotes a general phlogiſtic diatheſis through the ſyſtem more than a wound attended with an high degree of inflammation. In all relaxed habits we find, that, even in this climate, wounds are attended with leſs topical inflammation in ſummer than in winter; and, from peruſing the beſt authors that have lately written upon this ſubject, I find that, in wounds productive of tetanus, there is an abſolute want of this inflammation, ſo neceſſary to the cure and well being of the patient. Nay, I myſelf know, from gentlemen of undoubted abilities in their profeſſion, both in America and the Eaſt Indies, that, if inflammation and ſuppuration takes place, even in theſe climates, immediately after an injury that might be ſuſpected of inducing a tetanus, ſuch as, ſlight wounds or ſcratches on the fingers, or a ſplinter driven in below the nail, nothing of the kind takes place. Hence it is evident, or at leaſt very probable, that if in a wound threatening to produce a tetanus, we could induce this inflammation, the diſeaſe would certainly be prevented. Our firſt care, therefore ſhould be, in warm climates, or

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in cafes where we have reafon to fear a tetanus, to drefs the wound in fuch a manner as to bring on the requifite inflammation; and nothing can do this more effectually than to enlarge it confiderably, and apply a pledgit dipped in warm oil of turpentine.

It muft be obferved, however, that though dreffings of this kind, applied to the wound *before* a tetanus has come on, may very probably prevent it, yet we have no reafon to believe that they will remove it after it has come on. It is even doubtful, whether, after this dreadful difeafe has appeared, any application to the wounded part would raife the defired inflammation. In this cafe we muft do the beft we can, inftantly to remove, or at leaft palliate, the violence of the fpafms; and, while we do fo, an incifion made above the original wound, and dreffing this incifion with warm oil of turpentine, might poffibly be of fervice. The misfortune is, that now we have not time to wait for the effect of any ordinary medicine. The difeafe makes fuch rapid progrefs, that we are under a neceffity of ufing violent remedies, even though we thereby run the rifk of deftroying our patients afterwards, as has been remarked of opiates. Mercury has been much recommended in the tetanus, as well as the hydrophobia, but has not often been attended with fuccefs in either. It is evidently

too

too ſlow in its operation; but indeed, if we can give it in ſuch quantities as to produce ſymptoms of ſalivation in a day or two at moſt, it has a chance of being uſeful; for, while is is producing a ſalivation quickly, it brings on a diatheſis phlogiſtica; but I believe that, when it acts ſlowly, or after a ſalivation is thoroughly produced, it rather has a contrary effect, viz. that of relaxing the body, and thus tending to bring on the diſeaſe, if the wound be not healed before this happen. To avoid this, we ought to begin the unction with mercury as ſoon as the diſeaſe begins to ſhow itſelf; to rub in a very conſiderable quantity at once, and to ſtop as ſoon as the breath begins to turn fetid, or the gums to ſwell, leſt a ſalivation ſhould be excited, which would be contrary to the intention with which the medicine was exhibited.

Before I recommend any particular mode of applying the cold bath, I muſt once more take notice of the evils likely to ariſe from the uſe of the warm one. In this country, wherever we meet with any general relaxation of the ſyſtem, we alſo find the patients labouring under ſpaſmodic affections of the intercoſtal muſcles, or chronic pains about the joints with much flatus in the ſtomach and bowels. In theſe caſes, we know, from experience, that the uſe of the warm bath augments the debility, and increaſes the pains. Hence, medical practitioners have

uniformly agreed, that, in ſuch patients, the cold bath is the only proper cure; and directions have been given for conſtructing baths which may be uſed in their rooms, either by lying along in them, or by having the water to fall from a height through a box, in which there are a number of holes, like a ſhower. This is called a ſhower-bath, the other a chamber-bath. Theſe are uſed by weakly people who are not able to go abroad; but, for ſuch as are more firm, and able to endure the fatigue, nothing is better than ſea-bathing, regularly uſed for ſome length of time; and, in moſt caſes ariſing from debility, it produces the moſt happy effects. In an acute rheumatiſm, however, a diſeaſe conjoined with the higheſt phlogiſtic diatheſis, warm bathing is the proper remedy. I muſt now, therefore, be ſuppoſed to conſider tetanus as an exact contraſt to acute rheumatiſm; and, if this be the caſe, the treatment ought to be the direct oppoſite to what is proper in that diſeaſe. Of cold bathing, however, we muſt ſay what has been ſaid of other remedies; it muſt be puſhed to its utmoſt extent, which may always eaſily be done, if the ſurgeon is called at the beginning of the diſeaſe, by placing the patient in a tub about two feet and an half high, and three feet in diameter, pouring repeatedly, over his head and ſhoulders, buckets of water as cold as can be procured; and this repeated

peated according to the urgency of the ſymptoms, but not leſs than four times in twenty-four hours. During this time, the patient ſhould be made to drink half a gill of the beſt brandy every hour, with two ſcruples of the powder of bark put into it; and, if his ſtomach can bear it, from two to three ounces of bark, with a bottle and an half of port-wine in twenty-four hours. If, by theſe means, the ſtrength of the ſyſtem increaſes, every ſymptom of the diſeaſe will decreaſe. I have already given my opinion with regard to opiates. The ſmalleſt doſe that can be given, provided it will have any effect in relieving the ſpaſms, ought to be adhered to; and, if they can be kept under without opium, ſo much the better; but, if not, no doubt we muſt give it in large quantities. The doſe, indeed, cannot be aſcertained; but, we muſt always remember, that, after the ſtimulant power of opium is gone, it has a very remarkable ſedative effect, which, in perſons not accuſtomed to it, is productive of ſomething ſimilar to downright intoxication, and a very great degree of debility conſequent thereto. We muſt, therefore, be as careful as poſſible not to give immoderate doſes of opium after the ſpaſms are removed; or, at any time, more than is abſolutely neceſſary to keep them under. The ſtrength of the ſyſtem cannot be ultimately reſtored by medicines which act only for a ſhort time,

time, and then loſe their effect. It is evident that theſe are to be uſed only with a view to others which act more permanently, though ſlowly.

The ſedative qualities of one doſe of opium may indeed be prevented, by giving another before they have time to manifeſt themſelves; but this would require an endleſs ſucceſſion of doſes. By far the beſt method ſeems to be to counteract them, by giving large quantities of the moſt nutritious food, as ſoon as the ſpaſms are mitigated to ſuch a degree as to allow the patient to ſwallow. This is conformable to the doctrines delivered by the late Dr Brown, who, after a doſe of opium or laudanum, always ordered his patients to be ſupplied with ſome ſtrong and ſolid food, to prevent the debility which would otherwiſe take place. In reflecting on this ſubject, indeed, it naturally occurs, that, as food and drink, and not opium, or any other medicines, are the proper ſupports of the body, it is to theſe, and not to medicines of any kind, that we are to have recourſe ultimately, either for preſerving the vigour of the ſyſtem, or reſtoring it when debilitated. If, therefore, in this ſtate of health, a certain quantity of food and drink is requiſite for the preſervation of that ſtate, if the body be debilitated, ſo that it has only one half the vigour, a double quantity, or an equal quantity

tity of double the ſtrength, will be required. It may be objected, that, in caſes of debility, where the digeſtive powers are much weakened, the food would corrupt in the bowels, and increaſe the diſeaſe; but, to this it is anſwered, that the temporary ſtimulus of opium, or any other ſimilar medicine, gives to the ſtomach and inteſtines the power of digeſtion for that time, by making them exert what power they have more vigorouſly than before; and, when once the food is aſſimilated to the body, the ſyſtem is ſtrengthened of courſe. There are, indeed, innumerable inſtances where debilitated perſons, inſtead of requiring leſs food than others, require much more, as people newly recovered out of a fever, &c. There is, however, in the Medical Obſervations, Vol. 4th, a caſe ſo much to the purpoſe, that I cannot forbear quoting it. A woman of ſixty-eight years of age was ſeized with an hemiplegia, which deprived her of ſpeech, and the uſe of her right-ſide; in which condition, ſhe lived between five and ſix years. The account given of her is as follows: "From a little time after ſhe was ſeized with the palſy, to about five weeks before ſhe died, ſhe eat meat, (more heartily and greedily, indeed, than in her former ſtate of good health), and, by choice, rather the high ſeaſoned diſhes, both for dinner and ſupper, but drank ſparingly. All this time ſhe was never

ver ſick at her ſtomach, and ſhe never ſweated. She had a conſtant ſpitting, or drivelling of ſaliva. She was coſtive from the beginning of her illneſs; and this complaint increaſed to ſuch a degree, that, in a little time, ſhe ſeldom had a ſtool in leſs than a week, more frequently it was a fortnight, ſometimes three weeks, and twice together, only once in thirty days, that is, *twice* in *two months*; while ſhe was eating heartily all the time, and had no ſenſible excretion beſides, except the uſual quantity of urine, and the ſalival diſcharge above mentioned. And both times the evacuation would probably have been ſtill later, if four or five grains of jalap had not been daily taken (without her knowledge) in the beer that ſhe drank; from the time that ſhe had been a fortnight without a ſtool." In this woman, notwithſtanding the debility under which ſhe laboured, it appears that the powers of digeſtion were ſo far from being weakened, that they ſeem to have been much ſtronger than before; for in 30 days, that ſhe continued coſtive, the quantity evacuated bore a much leſs proportion to that taken in, than in perſons in health. We may ſafely venture to affirm, therefore, that in caſes of tetanus, we need not heſitate to give the patient as much of the ſtrongeſt food as he can take. From the circumſtances of the diſeaſe, indeed, little ſolid food can be given.

given. Strong ſoups, with the addition of a little pepper, ſeem to be the moſt proper.

Before I conclude this diſſertation upon ſtimulant medicines, I muſt ſtill take notice of one, which though, as yet little known in practice, promiſes fair to be of much ſervice in aſthenic diſeaſes. This is dephlogiſticated, or oxygenated air. From the experiments made by Dr Beddoes of Oxford, upon this air, it appears, that to perſons in health it is pernicious. It acts as a moſt violent ſtimulant, increaſing the powers of life to ſuch a degree that the ſtomach cannot ſupply the waſte it occaſions; and therefore a conſtant uſe of it would in healthy perſons bring on conſumptions. In phlogiſtic diſeaſes, therefore, it is exceedingly improper to preſcribe it; but, in ſome diſeaſes of debility, it has been tried with ſucceſs. From what we may judge *a priori*, of its effects in tetanus, it ſeems particularly well adapted for it. By being taken into the lungs, it is applied immediately to the blood, which it ſupplies with a vaſt quantity of vital principle to be from thence conveyed to the nerves. In healthy people, it produces a ſtrong propenſity to muſcular action; but, in tetanus, the voluntary muſcular action is entirely loſt, and violent convulſions come in its place. At any rate, therefore, it ſeems right to try this where it can be done, as the effects would be known

known by a few minutes breathing, and this could not be attended with any bad effects afterwards.

I come now to conſider another claſs of remedies which have been highly extolled by a modern writer on ſurgery, viz. Emollients, particularly the fat of fowls, or the oil produced by boiling the bones of animals. It is unknown to me, what virtue is poſſeſſed by theſe oils more than others; but if, by themſelves, they are capable of doing any good, I think they ought to be in a ſtate of rancidity; for thus they act as ſtimulants, and in ſome meaſure anſwer the general indication of cure. If any thing, however, is to be done by external applications, it would ſeem to be much more proper to uſe a ſolution of camphor in oil olive, in the proportion of three drachms of the former, to an ounce and an half of the latter, adding to the mixture half an ounce of cauſtic ſpirit of ſal ammoniac. This will act both as a ſtimulant and antiſpaſmodic; and, from repeated experience, I know that it is of ſervice in ſpaſmodic affections. Many women, in the laſt months of pregnancy, when very heavy, and of a delicate conſtitution, are exceedingly incommoded by cramps in their limbs and thighs, that ſometimes they can ſcarcely go to bed. Such patients are always relieved by uſing the ſea bath in ſummer, and rubbing the

the parts affected with the mixture juſt mentioned. Indeed, it is eaſy to ſee, from what we know of tetanus, and of emollient medicines, that the latter muſt be entirely improper in all tetanic affections; but that, on the other hand, ſuch medicines as the ol. camphorat. volat. have always a chance of being attended with the moſt ſalutary effects.

I ſhall now diſmiſs this ſubject, on which I have dwelt ſo long, with relating a few caſes, three of which were treated by Dr Benjamin Ruſh of Philadelphia. He informs us, that, in all the caſes of tetanus he ever met with, he never could ſucceed with opium; and, therefore, ſuppoſing it to be a diſeaſe produced by great relaxation and debility, he purſued a courſe nearly ſimilar to what I have laid down. Being ſoon after called to viſit a colonel who had been wounded in the foot, he found him in the third day of a tetanus; the ſpaſms were very violent, and his pains ſo exquiſite, that his cries were heard almoſt an hundred yards off; and, though large quantities of opium had been given him, the ſpaſms continued with unabated violence. Dr Ruſh inſtantly forbade the opium, and gave him large quantities of bark and wine, to the amount of about two ounces of the former, and three pints of the latter, daily. The effect of this was ſurpriſing; for, in a few hours, the

ſpaſms became leſs violent, as well as leſs frequent, and he ſlept for ſeveral hours, which he had not done for a long time before. A bliſter was put on between his ſhoulders, and had two or three ounces of mercurial ointment rubbed upon his throat; and, by continuing this courſe, he gradually recovered; being out of danger in ten days, though the ſpaſm continued in his wounded foot for ſeveral weeks.

The ſecond caſe, was of a gentleman's ſervant girl, who had brought on a tetanus, by ſleeping in the evening upon a low, damp, brick floor, after a very hot day, when the thermometer had ſtood at 90°. The diſeaſe was as alarming and violent as the former, and yielded to the ſame remedies; only a large doſe of oil of amber was given every morning, mid-day, and evening.

In the third caſe, a man, by trade a joiner, had a nail run into his foot. Next day he was viſited by Dr Ruſh, who found him in extreme pain, with ſome convulſions, and every now and then a twinge in his jaw. The wound had neither inflammation nor ſwelling. The wound was inſtantly dilated, and filled with lint moiſtened with oil of turpentine, which ſoon produced a conſiderable degree of pain and inflammation, with ſwelling of the whole foot. This was attended with ſuch good effect, that the ſpaſms left him in twenty-four hours after the Doctor came

to

to viſit him. After this he complained of nothing but pain in the wound, which was alſo much ſwelled. It ſuppurated well, however; and the ſuppuration continued for ſeveral weeks, after which it healed up kindly.

On theſe caſes, the Doctor remarks, 1. That the prediſpoſition to tetanus depends upon relaxation; and this relaxation is *always* produced by exceſſive heat and fatigue; particularly, if, after theſe have had their full effect, the patient be expoſed to cold and damp. 2. As this is a fact long eſtabliſhed, we may conclude, that the ſame thing happens in wounds, and that the only medicines calculated to cure them are ſuch as reſtore the tone of the ſyſtem; ſo that, on the whole, bark, wine, and topical rubefacients, are the only remedies that can be depended upon. The following caſes have fallen under my own obſervation.

I. J—n—G——t, a young woman aged twenty-one, ſervant to a farmer near Edinburgh, having been very much heated in making hay, in the beginning of July, wounded the arch of her foot by a ruſty nail, near the middle between the heel and great toe, and on the internal edge. Next day ſhe had a burning heat and violent pain in the wound, returning regularly at the interval of two hours. An emollient

mollient poultice was applied, and she went to work in the field as before. This day proved likewise very hot, the thermometer standing at mid-day at 79°, and the burning heat and pain increased to a great degree. In the evening of the same day, she felt severe pains darting from the wound, upwards to the knee; and before eight o'clock she complained of intolerable spasmodic affections, which now began to take place, in the muscles of the back part of the neck, and top of the shoulders, with violent cramps similar to what she used to have, when much fatigued, in the muscles of her thighs and legs; so that a locked jaw being apprehended, she was put under my care. Having the preceding year seen a patient die of tetanus in the Royal Infirmary, and being dissatisfied with the manner in which she was treated, as well as with what Dr Cullen or other authors had written on the disease, I determined to follow a quite different course. In that case, I had particularly observed the effect of the warm bath, and assured myself that the paroxism next after her having been in it was worse than before. As soon, therefore, as I was called to this patient, I removed the poultice, made a crucial incision upon the wound, of about an inch in length, fully as deep as the wound itself, filling it afterwards with charpee, moistened with Wade's balsam. She had a glass of Port wine, with

with half a drachm of powdered bark, every hour and half, as long as her ſtomach could eaſily bear it; and, at every eight hours, ſhe had a ſmall glaſsful of the beſt gin, mixed with three times its quantity of water, to be taken at twice in the ſpace of half an hour. By the next morning, at ten o'clock, ſhe had taken half an ounce of bark, and half a pint of wine, beſides the gin taken as directed. Her ſymptoms were all much reſolved; only the pain in the wound continued very great, as it had conſtantly been ſince the dreſſing in the manner above mentioned. Her pulſe beat eighty ſtrokes in a minute, and much fuller than before; for laſt night it was very feeble, and beat only ſeventy in a minute. As ſhe had been coſtive for three days, I now gave her ſeven drachms of the tincture of ſena, continuing her bark, and wine, &c. Next day ſhe was ſtill more relieved, and had no affection of the throat or jaw for the laſt twelve hours; and only very ſlight attacks of the ſpaſms in the neck and ſhoulders; but the pain, tenſion, and ſwelling about the wound, was ſtill very conſiderable; for which reaſon an emollient poultice was applied to promote ſuppuration, which ſeemed to be coming on apace. In three days from her being put under my care, the dreſſings came away with the poultice; there was a copious diſcharge

charge of well digeſted matter; and from this time no ſpaſmodic ſymptoms appeared.

II. In July 1781, I was called to a girl, who had got a large ſplint of wood run into the ball of her right thumb, from the handle of a rake which ſhe was uſing in hay-making. The weather was very hot, and had been ſo for ſome time, the thermometer having generally ſtood at 78°, for a fortnight before. The ſplinter, though almoſt an inch long, was eaſily extracted by ſome of her comrades; but, in twelve hours after receiving the injury, ſhe complained of very ſevere pains ſhooting up her arm to the ſhoulder, attended with an uncommon degree of reſtleſſneſs, and an uneaſy feel about her neck, ſhoulders, head, and throat. She applied a poultice to the wound, and rubbed her arm with anodyne balſam, but without any effect. For the firſt twenty-four hours, the ſymptoms increaſed gradually, until all at once ſhe was attacked with a very ſevere fit of the tetanus, on which I was immediately ſent for. This was the ſecond day after the injury was received; and, on examining the wound, which had been poulticed twenty-four hours, I found it ſtill as flabby and relaxed as it had been the moment it was received. She complained, however, of moſt violent pain in it, affecting not only the whole limb, but the whole body; and theſe pains, ſhe ſaid, aroſe from

ſpaſms,

ſpaſms, which made the whole body, as well as the extremities immoveable, at the ſame time. Though theſe abated a little every ten minutes, yet it was evident that they continually increaſed, ſo that the diſeaſe was very evident. From the happy event of the former caſe, I was encouraged to proceed in the ſame manner. The wound was immediately laid open through the whole length of the puncture, on the ſurface of which there appeared to be only a thin browniſh ſanies, ſomething reſembling that of a ſcrophulous bone; neither ſwelling nor tenſion appeared either about it or the ſurrounding parts. I dreſſed the ſore with pledgits dipped in equal parts of the tinctures of myrrh and bark; and, as ſhe appeared extremely feeble and languid, I gave her one ounce of the tincture of bark, with half an ounce of cinnamon water, and fifteen grains of the powder of bark, every two hours. In a few hours, the ſpaſms were ſo much abated, that ſhe could reſt for a conſiderable time, ſometimes an hour together. For dinner, ſhe had a mutton chop dreſſed in the grid-iron, and for ſupper an egg dropped in boiling water. The medicines agreed well with her; and, in five days from the time ſhe was firſt attacked, her ſpaſms ceaſed entirely, and ſhe had no complaint but from the ſore, which was not yet completely

completely inflamed and ſuppurated. Her medicines were now given only once in four hours, and her diet was of the moſt nouriſhing kind; the ſore was dreſſed like a ſimple ulcer; ſhe continued to enjoy the moſt perfect health, and ſoon got entirely free from every complaint.

## SECTION II.

### *OF PUNCTURED WOUNDS.*

THESE are made by any inſtrument which perforates to a greater depth than it ſeparates the divided parts, either longitudinally or laterally from each other, without regard to the ſhape of the wounding inſtrument itſelf, whether ſharp or obtuſe. The event of theſe is always more uncertain and dangerous than of any other kind, becauſe the large blood veſſels, or trunks of nerves, may be wounded, though we cannot perceive from the appearance of the wound that they are ſo. In all caſes, however, they are dangerous in proportion to the depth to which they penetrate, and as the inſtrument is more or leſs obtuſe; and hence gunſhot wounds are of all others the moſt dangerous, becauſe they

they are accompanied with the higheſt degree of contuſion and laceration. Punctured wounds of all kinds are, indeed, productive of a very great degree of inflammation, and, even on that account, extremely dangerous. By the violent action of a muſket ball, alſo pieces of the clothes are driven into the wound; beſides the danger there is of the ball itſelf lodging in it; ſo that it is often very difficult to clear ſuch wounds of extraneous bodies; and, even when they are cleared of them, the ſides remain at a diſtance from one another, and cannot be brought together by future, or by any other means, as in ſimple wounds.

The moſt favourable caſe of punctured wounds is, when they only penetrate the ſkin, and run through the cellular ſubſtance for a conſiderable way, parallel to the ſurface of the body, perforating the ſkin alſo on the other ſide, oppoſite to where it entered. When this happens to be the nature of the wound, there ought to be no heſitation at laying it open from one end to the other, in order to clear it of any extraneous matter. This being done, the wound ought to be dreſſed with ſimple cerate, and the dreſſings kept on by a ſlight bandage and compreſs.

The next favourable caſe is where the inſtrument has not penetrated both ſides; but, after perforating the ſkin, ſtops in the cellular ſub-

ſtance. The general directions given by chirurgical authors in this caſe, is to introduce a probe by the external opening, through the whole length of the wound; and, cutting upon it, to lay it open as before. The inciſion ought to be carried through the whole length of the wound, in all caſes where it has not penetrated any of the large muſcles, nor injured any of the blood-veſſels or nerves. But, where the wounds run deep, and in the neighbourhood of blood-veſſels or nerves, we cannot lay them open in this manner, the proper mode of treatment, then, is to prevent or remove the inflammatory ſymptoms from running too high, by leeches, cooling applications, and an antiphlogiſtic regimen, inducing throughout the whole extent of the wound a gentle ſuppuration; which, in every wound of this kind, muſt take place, becauſe none of them can be cured by the firſt intention. A poultice muſt be applied externally throughout the whole length, and in the ſame direction with the wound, which muſt be frequently removed, until the ſuppuration be complete. When this is done, and the wound appears free of any extraneous matter, we muſt gently preſs the ſides of the wound together, by means of a compreſs of a proper thickneſs applied to the wound throughout its whole length, applying over it a roller pretty firmly, and uniformly tight

throughout

throughout the whole length of the wound, by which its ſides will adhere in a very ſhort time. If, however, this manner of treatment be neglected for a week or two, and the poultice ſtill continued, there will be a conſtant diſcharge of matter, by which the ſides of the ſore become callous, ſo that though we were afterwards to preſs them together ever ſo much, they will not unite, but the wound is changed into a true fiſtula. When this happens, it may always be known by the condition of the matter. In a wound which is diſpoſed to heat, the matter is thick, mild, and of an unctuous nature; of a whitiſh yellow appearance, and ſomewhat ropy; but, in ſerous ulcers, the diſcharge is thin, and has a milky whiteneſs; and, by reaſon of the calloſity, their ſides acquire a ſmoothneſs, which is eaſily diſtinguiſhed from the appearance of a healthy wound. The proper method of proceeding in caſes of this kind, is to introduce a ſeton; by the friction of which, an inflammation will be raiſed on the ſides of the wound, and the matter ſoon acquire a better colour and conſiſtence. As ſoon as the ſurgeon perceives this, he muſt gradually diminiſh the ſize of the cord, in the manner already directed when treating of ſetons. When the cord becomes very ſmall, it may then be taken out altogether; and what little of the wound remains to be united, will eaſily be ſo, by applying

applying the compreſs, as juſt now directed. In many inſtances, this adheſion has been produced by the injection of aſtringents, or diluted ardent ſpirits, or any thing capable of exciting a freſh inflammation and ſuppuration in the wound; the ſides of which muſt be kept in contact from the beginning of this application, till the adheſion is formed throughout. If matters are properly managed at firſt, however, there will very ſeldom be any occaſion either for the ſeton, or aſtringent applications; for, in nine caſes out of ten, if the ſurgeon, as ſoon as a free and full ſuppuration takes place, would apply a compreſs to the wound, throughout its whole length, with a roller above, to keep it pretty tight, ſo that the ſides of the wound might be in contact, and preſerve them in that ſituation for thirty-ſix hours, the parts, even in that ſhort time, would begin to adhere; and, by perſiſting in this method, would be completely healed in ten, twelve, or fourteen days at moſt, with very little pain to the patient.

The bad conſequences of neglecting this kind of treatment, are but too often ſeen, even under the management of the moſt celebrated practitioners; for, the cure of ſuch wounds is often protracted for as many weeks as it would require days in the former method. By treating wounds of this kind in the manner juſt now recommended,

ed, when they run deep, and of courſe cannot be laid open, we may always be certain of making their ſides adhere to each other in a few days; but this muſt never be attempted until we are ſure that a free ſuppuration has come on, throughout the whole extent of the wound, and that every extraneous body is removed.

Sometimes the wound, inſtead of ſlenting to either ſide, runs directly to the bone, with only a ſmall opening at the ſurface, where wounds of this kind occur, and it can be done without wounding any conſiderable nerve or blood-veſſel; the wound ought to be dilated to the bottom, in the direction of the muſcular fibres, dreſſing it afterwards with ſome ſoftening liniment, ſpread upon linen; and this is to be continued until a full and free ſuppuration takes place through the whole of the wound; and, as ſoon as this takes place, we ought to unite the ſides, by means of the interrupted future, as in the caſe of recent wounds, that they may be healed by the firſt intention; and thus the wound will moſt commonly heal very readily and eaſily, without much pain to the patient, and with great eaſe and ſatisfaction to the ſurgeon. In this laſt caſe, we ought never to make uſe of counter-openings of any kind.

The uſe of injections in wounds of this kind, is to raiſe a freſh inflammation, by means of which,

which, the ſides will adhere together when held together with a compreſs and roller. Such as are moſt proper for this purpoſe, I believe to be thoſe which are not poſſeſſed of a conſiderable degree of aſtringency, nor have any great tendency to remove inflammation. The moſt proper are ardent ſpirits diluted with an equal quantity of water, and this thrown into the wound with a ſyringe, and confined in it for a ſhort time, till the patient complains of pretty ſevere pain. A ſolution of corroſive ſublimate, in the proportion of two grains to an ounce, is likewiſe found very efficacious; but, whether we uſe the one or the other, the ſides of the wound are to be put cloſe together, as ſoon as the injection is thrown in, till the new inflammation produces adheſion; and this muſt in a very ſhort time take place, if the compreſſion be equal and regular throughout the whole courſe of the ſinus. If, inſtead of uſing injections of this kind, we take a contrary method, and make uſe of thoſe of an antiphlogiſtic nature, the ſides of the wound will ſoon be rendered callous throughout its whole length, and thus the very intention with which the injections were preſcribed will be defeated; for the only uſe of them is to excite inflammation, not to allay it.

Collections of matter are ſometimes formed in wounds of this kind, when the preſſure happens

pens to be unequal. Thoſe take place near the bottom of the wound; and, unleſs the ſurgeon pays great attention, in caſes of this kind, to apply the bandage and compreſs properly, it may continue to collect, and burſt ſeveral times over; but even this will at laſt be overcome, by a proper uſe of the bandage and compreſs. But, if, for any reaſon, the ſurgeon does not think proper to attempt a cure by the firſt intention, he ought to proceed in ſuch a manner, that the incarnation may begin from the bottom upwards; which is very eaſily done where the wound is dreſſed very ſlightly, and only the mildeſt ointments are allowed to touch the ſore; the dreſſings being removed once in twenty-four hours, or oftener. Thus every wound, whatever be its depth, if ſituated in any of the extremities, without injuring any blood-veſſel or nerve, may very ſoon be healed without any tents made either of metal or any thing elſe. There may be ulcers indeed, which have penetrated into a cavity, ſuch as in the perinæum, communicating with the urethra. In caſes of this kind, we may uſe a metallic tube to carry off the water or matter, in order to allow the urethra to heal; but I have elſewhere treated of this at ſufficient length, under its proper head.

The only rational intention with which tents are ever uſed, is that matter may be prevented from

from collecting in the bottom, after the external wound is closed; but it is seldom that this takes place; and it never can do so if the method we have just recommended be followed; besides, as the aperture of the wound gives free vent to the matter at first, the latter generally keeps it open, unless in a very few cases, where it may be necessary to use artificial means for the purpose. Even here, however, the tents, if these are used, should be but small, for otherwise they will plug up the orifice, so that they will induce the very evil they are designed to prevent. Hollow tents, or tubes, are preferable to others, and ought to be employed on account of their allowing a free exit to the matter. They may be made either of silver or lead; but the latter are to be preferred, on account of the flexibility of the metal, which allows it to be adapted to any shape of a sinus.

## SECTION III.

### *Of CONTUSED AND LACERATED WOUNDS.*

These are produced by such instruments as are not well adapted to cutting; by which not only the skin and subjacent parts are torn, but

thoſe in the neighbourhood are conſiderably bruiſed. Wounds of this kind are always more dangerous than thoſe of the ſimple inciſed kind; though frequently the latter have a more formidable aſpect than they, by reaſon of the retraction of the lips from one another, or where any blood-veſſel of conſequence happens to be divided. Lacerated wounds, indeed, never bleed as freely as inciſed wounds, by reaſon of the diſtraction and contuſion of the divided veſſels, which make the wound ragged and irregular; inducing alſo, in all probability, a paralytic diſpoſition of the veſſels for ſome ſpace about the wound, by which means the blood cannot be propelled with the ſame force as before, and therefore ſoon coagulates. But it is otherwiſe with inciſed wounds; for, in them, the veſſels are cut ſmoothly, without any injury to the parts about the wound; ſo that they have the ſame power of propelling the blood as before, and therefore it flows out freely.

By reaſon of the injury, in lacerated and contuſed wounds, done not only to the vaſcular, but alſo to the nervous ſyſtem, the ſenſation of pain is generally not very great; and therefore the patient will often complain much more where the integuments are not much torn, and, of conſequence, the nerves leſs injured. The firſt conſequence of this kind of wounds, how-

ever, as well as of all others, is pain, ſwelling, and inflammation; the ſwelling beginning in the retracted edges, increaſing conſiderably as well as the pain and tenſion. Where the injury has not been very violent, provided the dreſſings have been mild, and the wound well defended from the common air, it will often heal naturally after ſuppuration, as in common wounds. But, if any very conſiderable injury has been done to the parts, or where any bone is fractured, which not unfrequently happens, the inflammatory ſymptoms run ſo high, that a gangrene takes place. It is indeed evident, that, where a very great injury is done to the ſoft parts, ſo that their figure and texture are almoſt entirely deſtroyed, gangrene muſt be the natural conſequence. But in healthy ſubjects, where the injury is leſs ſevere, ſo that the blood-veſſels and bones are ſafe, the patient will generally recover; though, where the conſtitution is broken, or the habit much diſeaſed, it will require all the ſkill of the moſt expert ſurgeon to prevent a gangrene from taking place.

In wounds of this kind, the patient ought to be put to bed, and the wounded limb placed in the moſt relaxed poſture, ſo as to eaſe, as much as poſſible, the wounded or torn muſcles. The wound ſhould, as quickly as poſſible, be freed from every extraneous matter, as well as from broken

broken pieces of bone; and the wounded and bleeding veſſels being properly ſecured, the lacerated edges ought to be placed as near to each other as poſſible; after which the whole muſt be covered with a large pledgit ſpread with emollient ointment, with two or three folds of linen put over all. As the inflammatory ſymptoms run very high, and are apt to terminate in gangrene, we muſt endeavour, by every poſſible means, to prevent ſuch a dangerous event. In young and plethoric patients, ſome ounces of blood ought to be taken from the arm; and, as in caſes of this kind, the wound bleeds little; though ſeveral ſmall arteries may be wounded, we muſt apply leeches all round the ſore; encouraging the diſcharge of blood by the application of large emollient poultices applied warm. If leeches, as it ſometimes happens, cannot be procured, we muſt, with the point of a fine lancet, make a number of punctures through the ſkin, and endeavour to draw blood from them with a cupping glaſs; which, if done at all, ought to be in as great quantity as poſſible; for we know of nothing which gives greater and more effectual relief in the inflammation attending wounds, than taking blood freely away round the tumified edges. The bowels ought alſo to be kept open, by gentle cooling laxatives, while the food and drink ought to be of the moſt ſimple and

light

light kind. In cafes of very fevere pain, opiates, in pretty large doſes, muſt be given twice in twenty-four hours; to an healthy, full grown perſon, not leſs than thirty drops in the morning, and as much at bed-time. A large emollient poultice is to be applied, of ſuch a ſize as exactly to cover the wounded parts, and ought to be renewed every ſix hours, to promote, as much as poſſible, a reſolution of the ſwelling of the limb; but, as ſoon as the ſuppuration becomes complete, the poultice muſt be removed, and the diſcharge promoted by mild dreſſings alone. When the injury is very great, however, wounds of this kind are very apt to become gangrened. This always happens in one of the following ways. 1. When the arteries of the limb are totally deſtroyed; or, 2. By a very violent inflammation, which cannot be reſolved, and ends in gangrene, in ſpite of every attempt to end it either by reſolution, or ſuppuration. In all cafes, where we have reaſon to fear that a gangrene will take place, we ought to lay aſide the antiphlogiſtic regimen, and endeavour to ſupport the patient's ſtrength by as nouriſhing a diet as the patient's ſtomach can eaſily bear; attempting at the ſame time to reſtore the tone of the ſyſtem by cordial liquors, given in proper quantities, ſo that the patient may be invigorated, without being much heated, or his pulſe much

much quickened. In other patients, particularly thoſe who have been accuſtomed to drink ſtrong malt liquors when in health, we muſt allow them the uſe of the ſame now; and, in ſuch perſons, it will be found that malt liquor anſwers much better even than wine. The ſame muſt be done with thoſe who have been accuſtomed to ardent ſpirits. They are to be allowed their favourite liquors, only not in ſuch quantity as to heat or quicken their pulſe in any great degree. Tonic medicines, ſuch as the Peruvian bark, in fine powder, and given in doſes of not leſs than a drachm at a time, are very proper. Theſe doſes are to be repeated every two hours, if the patient's ſtomach will bear it. But, in caſes where the patient has nauſeated the powder, I have uſed with much ſucceſs the following mixture;

℞ Pulv. cort. Peruv. ſubtiliſſ. ℥ ij
Mucilag. G. Arab. opt ℥ iij
Tinct cort. Peruvian.
Aq. cinamom. ſimp. *aa* ℥ iv
Sp. vetriol q. s. ad gratam acidetatem. *M.*

Of this the patient was to take two table ſpoonfuls every hour and half; and, in many caſes of putrid ſore throat, where the bark by itſelf would not ſit upon the ſtomach, it became agreeable to

to the patients, when prepared according to the above formula. I have alſo found, that, in caſes where the debility was very great, wine and bark, perſevered in for ſome time, without any good effects, a bolus compoſed of twelve grains of volatile ſal ammon. made up with half a drachm of conſerve of roſes, and given three times a-day, has proved extremely ſerviceable in ſtrengthening the ſyſtem, ſo as to enable it to put a ſtop to the gangrene; and, by perſevering in the uſe of this, along with the opiate, morning and evening, the diſeaſed parts may at laſt be thrown out, and the wound afterwards dreſſed as a ſimple ulcer. But, having already fully treated of gangrene in another place, I muſt refer to the chapter on that ſubject. I ſuppoſe it will be needleſs to caution any practitioner, who is even but moderately ſkilled in his buſineſs, againſt blood-letting, or any other evacuation, where gangrene is coming on; for, by theſe, the tone of the ſyſtem is remarkably weakened; and, the more evident that the ſymptoms of the diſeaſe are, the greater will be the injury done to the ſyſtem by any evacuation. But, while I caution the practitioner againſt any evacuation, after the gangrene has made its appearance, I muſt no leſs ſtrongly recommend them in the beginning, while the ſymptoms of inflammation may be expected to run high; and that,

that, eſpecially in robuſt conſtitutions, where the powers of life ſtill retain their vigour, after the injury has been received, as in ſoldiers and ſailors. In theſe we ought to take blood very freely all about the edges of the wound, and particularly on the contuſed places. If this is done, there is very little probability that a gangrene will enſue in any caſe, even after the moſt violent injuries, if, along with the proper evacuations, we take care to keep the patient in the moſt eaſy poſture, and to free the wound from any extraneous bodies that may irritate and ſtimulate the wounded parts. The edges of the wound are alſo to be kept as near as poſſible to one another, and the dreſſings ought to be of pieces of linen ſpread with the mildeſt ointment, covering the whole up afterwards with ſeveral folds of linen put over the dreſſings. In all caſes where the contuſion extends to any conſiderable diſtance from the wound, we muſt take care to bleed freely all round it with leeches, or by cupping with ſcarification. If neceſſary, we muſt bleed freely at the arm, to keep the body cool; and, after each free bleeding from the vicinity of the wound, cover it with cloths moiſtened with the ſolution of ſugar of lead.

By a due perſeverance in this method, the inflammation, which extends to ſome diſtance from the wound, will generally terminate by reſolution;

tion; the linen folds, which were directed to be laid over the wounded part, being removed, and an emollient poultice put in their place, exactly of the ſize of the wound, and changed regularly every ſix hours; while, at the ſame time, if the pain and ſwelling ſtill continues, in the neighbouring parts, they ought to be covered regularly with the ſaturnine cloths. As ſoon as a free ſuppuration takes place, the wound ought to be dreſſed, as a ſimple purulent ulcer, in the manner already deſcribed; and, if the pain, tenſion, and ſwelling, are ſtill conſiderable round the wound, we ought to continue our reſolvent method; but, if we ſee that a mortification will actually take place, we muſt uſe every endeavour to put a ſtop to it, as quickly as poſſible. The means of doing this have been already particularly treated of; ſo, at preſent, I ſhall only take notice, in general, that they conſiſt of ſuch things as keep up the tone of the ſyſtem, and invigorate the body. The mortified or gangrened parts are always ſeparated from thoſe which are found by an inflammation and ſuppuration; and the firſt ſign of this, is the appearance of a red inflamed ring round the edge of the mortified part. This inflammation may be excited, or, at leaſt greatly promoted, by the application of warm and ſtimulating dreſſings; but, as ſoon as this is obſerved to take place, we muſt diſcontinue

tinue the uſe of them, and have recourſe again to emollient poultices, to promote the ſuppuration neceſſary to ſeparate the mortified parts from the ſound. Such as are completely mortified, ought to be removed; not only as they are abſolutely uſeleſs, but on account of the offenſive ſmell which they occaſion. Amputation ought never to be employed, till the mortification has been ſtopped.

## SECTION IV.

### *OF POISONED WOUNDS.*

In this country, we have few venomous animals, and the poiſon of thoſe which we have is not commonly attended with fatal effects; if we except the bite of mad animals, which are common to all countries, and equally dangerous unto all. It is true, that, by introducing into a wound the matter of the ſmall pox, cancer, &c. we may poiſon the ſyſtem in ſuch a manner as to produce theſe diſorders; but theſe do not properly come under our notice in this place; the only wounds of the poiſonous kind, which we have to conſider, are thoſe made by the ſtings of waſps, bees, &c. and the bites of vipers.

The moſt formidable creature of the winged kind in Britain is the hornet. It is not met with in Scotland; but there are neſts of them in ſome of the woods in England. Its ſting, though more painful than either that of the waſp or bee, is not, however, attended with any dangerous conſequence. The waſps ſeldom ſting, unleſs irritated by the deſtruction of their neſt, and then they attack in great numbers every one who paſſes by. The bees ſting more frequently; and the human breath is ſaid to be particularly offenſive to them; ſo that it is part of the ſecret of thoſe who make them ſwarm, without danger to themſelves, upon any part of their bodies, to keep their breath from them, as much as poſſible leſt they ſhould thereby be provoked to ſting them. The ſtings of all theſe creatures are attended with a ſharp pain in the part, very quickly ſucceeded by an inflammatory ſwelling, which in no long time goes off of itſelf. It may, however, be prevented by rubbing the part, immediately after the injury, with honey, oil, vinegar, or ſpirit of wine, or even by immerſing it in cold water. The ſtings of muſkitoes and gnats, though leſs painful than thoſe of bees, are often attended with more formidable ſwellings; but may alſo be cured by ſimilar means. There are ſeveral inſects in this country, which do not fly, that ſeem to have ſomething poiſonous in their bite,

bite, but it is of ſuch a trifling nature as not to be worth notice.

The ſcorpion is not found in this country, but is plentiful in France, Italy, and all the ſouthern parts of Europe, as well as in Africa, and both the Indies. In temperate climates, the animals do not grow to a large ſize, and therefore their ſting, though painful, is not dangerous; but, in the very hot parts of Africa, India, and America, they grow to a great ſize, and their bite is mortal. The remedies commonly adviſed in theſe caſes are very abſurd. It has been recommended to kill the ſcorpion, and apply it, when bruiſed to a maſh, to the injured place; or, if we have not a ſcorpion, to take a toad, or ſome other animal ſuppoſed to be of a poiſonous nature. With reſpect to the toad, however, we now know that this is a miſtake; and it is generally agreed, that the toad, however calumniated, is abſolutely harmleſs; and indeed, it is impoſſible to ſee what uſe it would be of, though ever ſo poiſonous. It is more probable, that cooling and emollient remedies, ſuch as are uſeful for the ſtings of waſps and bees, will alſo be uſeful for the ſtings of ſcorpions; and that this is the caſe we have lately been aſſured of.

The bites of ſerpents are the moſt formidable animal poiſons we know of, and in many of the hot countries are exceedingly mortal. It is not well

well known whether the accounts of the ancients concerning theſe matters are to be credited or not. That they are exaggerated, we may very reaſonably believe; but ſome authors have aſſured us, that ſerpents, with the properties deſcribed by Lucan, in his Pharſalia, do really exiſt in Africa; as the *aſp*, which throws the perſon bit into a deadly ſleep; the *hæmorrhous*, which produces an univerſal diſſolution of the blood, ſo that it flows from every pore of the body; the *dipſas*, which cauſes an unquenchable thirſt, &c. On the other hand, our late traveller, Mr Bruce, affirms, that, in all the parts of Africa over which he travelled, he never ſaw more than one or two ſpecies of poiſonous ſerpents, not different from the common viper in more temperate climates. Modern zoologiſts, indeed, ſeem inclined to confound all the different kinds of poiſonous ſerpents under one generic name of *viper;* but, however they may agree in general characters, it is impoſſible to believe but the rattle-ſnake, an animal peculiar to America, is eſſentially diſtinct from the viper of Europe, or other countries, as well as the *ceraſtes*, or horned ſerpent. The bite of the rattle-ſnake of America, and of that called the *cobra de capello* in the eaſt Indies, are ſaid to be the moſt ſpeedily mortal, inſomuch that there is ſcarce time to apply any remedy, even though it be at hand at the very moment the

the bite is received. Mr Cataſby, in the preface to his natural hiſtory of Carolina, informs us, that the Indians, who, by their conſtant wandering in the woods, are liable to be bit by thoſe venomous animals, know as ſoon as they receive the injury, whether it will prove mortal or not. If it be on any part at a diſtance from large blood-veſſels, or where the circulation is not vigorous, they apply their remedies; but, if any vein of conſiderable magnitude happens to be hurt, they quietly reſign themſelves to their fate, as knowing that they could then be of no benefit. It is not well known what the remedies are on which they chiefly depend. Seneka root, and volatile alkali, are among the number; but we have ſo few hiſtories, or rather none at all of the diſeaſe that can be depended upon, that we can ſcarce ſay any thing about the matter.

The only perſon who has particularly conſidered this ſubject, of the bites of ſerpents, is the Abbé Fontana. He agrees with Dr Mead, that the poiſon of the viper is neither acid nor alkaline; but denies that he could perceive in it any thing like ſalts, by means of a microſcope, which Dr Mead ſays he ſaw. He even denies that it has any determinate taſte when put upon the tongue; though Dr Mead aſſures us that both he and others who had taſted it felt it exceedingly

ingly ſharp and burning to the taſte; and he particularly takes notice that one gentleman, who could not be ſatisfied without taſting a large drop undiluted with water, had an inflammation of his tongue and the inſide of his lips of ſome continuance.

It is of no ſmall conſequence, towards the cure of ſuch bites, to conſider attentively the ſymptoms which take place in the patient, whether they indicate any violent ſtimulus ſuddenly applied, in conſequence of which the perſon dies of an univerſal inflammation, or whether it operates by ſuddenly checking the vital power to ſuch a degree that it cannot be reſtored. From a vaſt number of experiments made by M. Fontana, he concludes, that the bite of an ordinary viper will not prove fatal to a full grown perſon, nor even to a large dog, though it certainly will do ſo to ſmaller animals. Five bites from three ſtrong and healthy vipers were not able to kill a dog weighing ſixty pounds; and, as this dog was little more than a third part of the weight of an ordinary man, he concludes, that a ſingle bite can never be fatal to an adult. In confirmation of this, he ſays, that he has ſeen a dozen of caſes himſelf, and that he has heard of fifty more, only two of whom died. Concerning one of theſe caſes he could get no information; the other periſhed of a gangrene, twenty days after the bite,

bite, and which began in three days after it, the bitten place having been deeply ſcarified almoſt immediately after the injury was received. Our author is of opinion, that much of the faintneſs, &c. which enſue upon the bite of a viper, are the mere effects of terror. "Upon a perſon's being bit, the fear of its proving fatal terrifies himſelf and the whole family. From the perſuaſion of the diſeaſe being mortal, and that not a moment is to be loſt, they apply violent or hurtful remedies. The fear increaſes the complaint. I have known a perſon that was imperceptibly bit in the hands or feet, and who, after ſeeing the blood, and obſerving a viper near him, has ſuddenly fainted away; one, in particular, continued in a ſwoon for upwards of an hour, until he was accidentally obſerved, and recovered out of it by being ſuddenly drenched in cold water. We know that death itſelf may be brought on by very violent affections of the mind, without any internal diſeaſe. Why may not people that are bit die from a diſeaſe produced entirely from fear, and who would not otherwiſe have died from any complaint produced by the venom?"

There is no doubt that M. Fontana has beſtowed a great deal of attention upon this ſubject, but it muſt certainly be evident that the above reaſoning is hypothetical and inconcluſive.

That

That ſome very timid, delicate, or nervous people might die from fear alone, is not to be doubted; but it is by no means fair to conclude from thence, that the generality of people will do ſo. It is eaſy to ſee, that the bite of a viper muſt be more or leſs dangerous according to circumſtanes. It depends on the creature itſelf to throw out more or leſs of this poiſon; and the greater the rage is into which it is thrown, the greater quantity it will throw out. If it has bitten any creature ſoon before it bites a man, the latter will be in leſs danger, becauſe the quantity is but ſmall. In like manner, when the perſon is bit through his clothes, they will abſorb a quantity of it, and therefore the wound will alſo be the leſs dangerous; and the ſame thing muſt happen when only the ſmall veſſels are wounded; for then only a ſmall quantity can be conveyed to the heart and other vital parts. It muſt be otherwiſe, however, when the bite is inflicted upon a bare place of the body, and the poiſon is conveyed directly into a large vein, ſo that it is quickly conveyed to the heart, there can be little doubt that it will very ſoon manifeſt its deleterious effects. Nay, M. Fontana himſelf informs us of a woman in Tuſcany, who, though bit only in the little finger by a viper, fell into an hemiplegia, which could not be removed; and, if ſuch a violent diſeaſe could be induced by

a wound inflicted at ſuch a diſtance from the heart, we can have no reaſon to ſuppoſe, that, had the viper been large, and the poiſon quickly conveyed to the heart, that death would not have enſued.

The ſymptoms which take place on the bite of a viper, as enumerated by the generality of authors, are. 1. A violent burning pain, with tenſion in the injured part. 2. The whole of the affected limb, and ſometimes the whole body, becomes tenſe and inflamed in like manner. 3. The patient becomes extremely faint, the pulſe low and feeble; he has a giddineſs in his head, naufea, and vomiting. 4. There is a fixed pain in the region of the heart. 5. The urine becomes tinged, of a deep yellow, the ſkin becomes yellow like one who has the jaundice, and there is an evident diffuſion of bile throughout the whole vaſcular ſyſtem. 6. Cold ſweats, with ſlight convulſive motions, enſue; and, if relief be not ſoon obtained, death is the conſequence. Theſe ſymptoms come on within twelve or fourteen hours after the bite, ſooner or later, according to the violence of the injury; and the ſooner they make their appearance the more dangerous they are.

M. Fontana is of opinion, that the poiſon of the viper is of a gummy nature; which, however, does not throw any light upon its mode of operation.

ation. The quantity indeed is so small, that it most naturally occurs to us to be something which instantly acts upon the vital principle contained in the blood, like a very violent shock of electricity. From the experiments he has made upon brute animals, he concludes, that it kills by destroying the irritability of the system. But this, in fact, is saying nothing at all; and he might as well have told us that it kills by bringing on death. The desideratum is, what change is induced in the body by the bite of a viper? and by what means can this change be counteracted?—M. Fontane informs us afterwards, that it seems to induce a tendency to putrefaction throughout the whole body Now, this tendency to putrefaction, we know, proceeds from a deficiency of the vital power; and hence, as M. Fontane informs us, those who have been bit complain first of an universal weakness; their muscles refuse their office, they become dull and heavy, have no longer the free use of body, or mind, and fall insensibly into a kind of lethargy. When small animals die of the bite of a viper, their flesh becomes, at once, so tender, that the limbs may easily be pulled off from the body; and, in twenty four hours, their bodies become quite putrid.

The cures recommended for the bites of vipers are, according to M. Fontana, not only of very different,

different, but even oppoſite qualities. "In no country, (ſays he), through which I paſſed, could I ever find any two people or perſons bit by the viper, either in the mountains or valleys, that uſed the ſame remedies. Some uſed theriaca alone, either externally or internally applied; others common oil; a third ſet uſed ſtimulants, ſuch as the ſtrongeſt ſpirituous liquors; whilſt others, on the contrary, tried every different kind of ſedative. In ſhort, there is hardly any active kind of medicine that has not been tried as a cure in this diſeaſe; while, at the ſame time, it is certain, that, under all the varieties of application, none of them died." Hence, our author concludes, that none of the remedies made uſe of had any effect in curing the diſeaſe; which, indeed, is by no means improbable, conſidering that many of them muſt have acted in a manner directly contrary. But this only proves that the bites of the vipers of Italy are not mortal. In a hotter climate, they certainly will be attended with more dangerous conſequences. Hence, in the iſland of Malta, even in the winter time, when the viper came out of the fire, no doubt enraged to the utmoſt degree, and faſtened on the hand of the Apoſtle Paul, the people expected that "he ſhould have ſwoln, or fallen down dead ſuddenly;" whence we may ſee, that, in Malta, which is indeed very hot, the ſymptoms attending

attending the bite of theſe creatures were then extremely violent; and it was thought miraculous to eſcape death in conſequence of it. And we have the moſt undoubted authority for believing, that, in America, as well as the Eaſt Indies, the bite of ſome ſerpents is attended with very ſpeedy death. With regard to the cure of the bite of vipers, in ſuch animals as were liable to be killed by it, our author ſays, from his own experience, that neither ſcarifications, nor even the exciſion of the part, are beneficial, but, on the contrary, hurtful. We may, indeed, readily conclude that ſcarifications muſt be hurtful, becauſe they do not tend to take away the poiſon, but rather to allow it more free acceſs to the blood; but, we cannot ſo well ſay this of exciſion, if properly performed. Perhaps the poiſon may be injected to ſome depth, ſo that the place where it is lodged may not be cut away; and, if this be the caſe, it muſt do harm for the ſame reaſon that ſcarifications do. In like manner, he found oil, volatile alkali, theriaca, &c. either uſeleſs, or abſolutely hurtful, particularly the volatile alkali. The only thing which he found of any avail, was the tying of a ligature round the bitten limb to ſtop the progreſs of the blood towards the heart. This certainly muſt prevent, in ſome meaſure, the diſeaſe from becoming general throughout the ſyſtem, and therefore ought always

always to be uſed. It likewiſe promotes a flux of blood from the wounded part, by which the poiſon will be partly diſcharged; and, if to this precaution we add that recommended by Dr Mead, of ſucking the wound, it is probable that death might be prevented, even after a bite of the moſt deadly ſerpent. This practice, of ſucking the wound, has been recommended very early; and, indeed, if it can be done with ſafety to the perſon who ſucks, it has every appearance of ſucceſs. Dr Mead is at ſome pains to ſhow that it may be done with ſafety; but I am altogether at a loſs to account for the difference between him and M. Fontana, concerning the taſte of the poiſon; the former affirming, from his own experience, and that of ſeveral others, that it had a violent hot and fiery taſte, as if the tongue was ſtruck through with ſomething burning or ſcalding; while M. Fontana as confidently affirms that it has no taſte, nor raiſes any inflammation on the tongue. Dr Mead affirms, that, in a gentleman already mentioned, an inflammation was raiſed on the tongue, which did not go off in two days.

In treating this diſeaſe, Dr Mead ſeems to lay conſiderable ſtreſs upon emetics; and, indeed, in all caſes where the bite ſeems to be diffuſed through the body, this remedy has a chance of being uſeful, by relieving the extreme ſickneſs and

and naufea with which the patient is affected; for nothing produces greater ficknefs than a putrefcent bite on the ftomach.

It is evident, that, in cafes of this kind, external applications can avail but little. Oil has been recommended; but the trials made by Dr Mead fhowed it to be infufficient. He feems to have fome confidence in the fat of the viper itfelf; but, it is evident, that the fuccefs of this, or any other remedy of the kind, muft depend entirely upon an accidental circumftance. It is not impoffible, that, if any oily matter could get at the poifon, it might fo blunt or foften it, that its deadly effects would be prevented; but it is eafy to fee, that, by reafon of the narrownefs and depth of the wound, we have but a fmall chance of mixing it with the poifon, after it has once been injected. Nevertheleſs, this has perhaps been fometimes done; and thus, both oil olive, and vipers fat, have gained their reputation, though, in by far the greateft number of inftances, they could be of no efficacy.

To complete the cure, Dr Mead recommends the ufe of warm cordials, among which he mentions volatile fal ammoniac, to produce a fweat, and feems indeed to infift upon thefe medicines as neceffary for the recovery of the patient. Indeed, from what we can conclude concerning the nature of this difeafe, it is probable, that the cure

cure can only be accompliſhed by means of the very higheſt cordials. An univerſal inflammation ſeems firſt to be excited; but this runs through the inflammatory ſtage ſo faſt, that we have no time to apply the antiphlogiſtic regimen, before the inflamed parts, or rather all the parts of the body, acquire a gangrenous tendency. The bite of a very poiſonous ſerpent, therefore, induces a diſeaſe ſomewhat ſimilar to a very ſevere plague, in which, we are told, that there is ſometimes very little interval, between apparently perfect health, and ſuch a gangrenous ſtate of the blood and juices, as produced purple ſpots, the immediate forerunners of death. In either of theſe caſes, it is difficult to ſay, whether any thing could be done or not; nevertheleſs, in the bites of ſerpents, we are ſure that the wound is the original ſource of the diſeaſe; and therefore, the precaution of cutting off all communication betwixt it and the heart, by means of a ligature, ought by no means to be omitted, even though it ſhould be ſome time before the ſurgeon is called; for, if the poiſon has a gummy nature, it will be ſome time before it diſſolves entirely in the blood; and, until it does ſo, it cannot produce its full effect. Beſides this, it would ſeem proper to apply the ſtrongeſt antiſeptic and cordial medicines we have; and it is probable that we have none better than bark

and

and wine. Vegetable acids, taken in great quantities, are ſaid to be uſeful in the plague. It is certain, from ſome late experiments, that they ſweeten the bite, and deprive it of its acrimony; ſo that they might have ſome chance of doing good, in removing the conſequences of thoſe bites, where the bite ſeems to be ſo much affected.

In this country, the bites of ſerpents are not mortal, either to the human ſpecies, or to cattle. The latter are frequently bitten, when wandering in the hills; and the conſequence is a permanent tumor on the part. I have not heard of any remedy uſed in this caſe; except the ridiculous one of waſhing the part with an adder's ſkin. It is not impoſſible, however, that the application of cold water may be of ſome uſe, though the *ſkin* with which it is applied can be of none.

A much more common, and indeed a ſtill more terrible diſeaſe, than the bite of almoſt any ſerpent, is the hydrophobia, which enſues on the bite of a mad animal. Indeed, it is not always the conſequence of a bite; for there are ſome very well atteſted inſtances of its having come on ſpontaneouſly. One of theſe is given in the firſt volume of the Medical Eſſays, where an hydrophobia was the conſequence of an inflammation of the ſtomach; and, I have lately heard

heard of one in Ireland, where the diſeaſe was occaſioned by a fright, and terminated fatally. The bites of mad animals, however, moſt commonly bring on the hydrophobia; and though, in brute animals, this ſymptom of the dread of water does not appear, yet in dogs, foxes, and wolves, the madneſs which occaſions this fatal ſymptom in the human ſpecies, not only comes on ſpontaneouſly, but is very common, and, we are not yet aſcertained what it is that brings it upon them. Cats have very often been infected with this diſtemper; but whether the diſtemper in them comes on ſpontaneouſly, or is always the conſequence of a bite, we do not know; though it is moſt certain, that, when mad, they are even more miſchievous than dogs themſelves, and their bite at leaſt equally pernicious. There is a very remarkable difference, in point of danger, according to the circumſtances in which a perſon is wounded, by the bite of a mad animal. As this poiſon always affects the throat, the nearer the part bitten is to the throat, ſo much the greater is the danger. A large wound is alſo ſaid to be leſs dangerous than a ſmall one, becauſe the flux of blood tends to waſh away the poiſon. This is contrary to what happens in the bites of ſerpents; and, if true, would lead us to think that the hydrophobic poiſon does not operate upon the maſs of blood at large, but u-

pon the lymphatic ſyſtem. It makes alſo a moſt material difference, whether the part bitten be covered with clothes or not. The reaſon of this is, that the poiſon of mad animals reſides in their ſaliva, which of courſe is wiped off when the teeth penetrate any thick covering; and, therefore, when a perſon is bitten through a ſhoe, boot, or even a glove, or thick coat, there is commonly but little danger; at leaſt there are no inſtances of people bitten in this manner, that have been ſeized with the diſeaſe. It is far otherwiſe with the bites of ſerpents; for, as their teeth are extremely ſharp, with an hollow ſlit in them, the poiſon, which lies in a ſmall bag at the root of the tooth, is ſqueezed into the wound, after the tooth has penetrated the clothes. Of this we have a remarkable hiſtory of one who was bit by a rattle-ſnake through a boot made of thin leather, ſuch as is worn by thoſe who are obliged to go into places infeſted by theſe venomous animals. This man died; and another having bought his boots, was ſeized as ſoon as he put them on, with ſymptoms reſembling thoſe which attend the bite of a rattle-ſnake, and died alſo. On examining the boots carefully after this accident, it was found that, in biting the firſt perſon, one of the fangs of the animal had been torn off and left ſticking in the boot; and

thus

thus the ſecond perſon, having been ſlightly ſcratched by the tooth, was alſo deſtroyed.

As the ſymptoms which enſue, in conſequence of the bite of a mad animal, are very long of making their appearance, ſo it would ſeem that there was a conſiderable probability of preventing them in *all* caſes; and here we can only expect to *prevent*; for the inſtances of a *cure* are ſo few, that we can lay no ſtreſs upon any medicine hitherto tried. That ſomething does prevent this diſeaſe, in many caſes, is very certain; for only a few are ſeized with the hydrophobia out of the great number that are bitten by almoſt every mad dog; but, what the preventative is, no perſon has hitherto been able rightly to point out. In the Philoſophical Tranſactions, we have an account of one phyſician, (Dr Woulf), who had under his care at once *ſeventeen* perſons who had been bit by a mad wolf. From his treatment of theſe, it appears that neither evacuations, cold bathing, bark, nor antiſpaſmodics, are preventatives. He inclines to have ſome confidence in volatile alkali; for none of the patients, who took for ſome time 100 drops of this daily, were ſeized with the diſtemper; but adds, that five others, who had taken nothing, continued as well as they. As internal remedies are ſo uncertain, we muſt therefore depend upon the evacuation of the poiſon itſelf by the wound, as the

the beſt, perhaps the *only* preventative we have. There is the greater probability of ſucceeding in this, by reaſon of the great length of time that intervenes between the bite and the commencement of the hydrophobic ſymptoms; and the ſucceſs becomes the more probable, when we conſider that there are two periods at which this may be attempted. The one, and which ought never to be neglected, is the very time that the injury is received, or as ſoon after as poſſible, when the part about the wound ought to be cut out as deep as the tooth has penetrated, or rather more; taking away, at the ſame time, the ſkin all round the bite to the diſtance of two inches, leſt ſome of the ſaliva ſhould remain upon it, and get into the wounded part. If, however, no ſurgeon be at hand, nor other perſon, who will venture to cut out the piece, or if the patient himſelf will not ſubmit to it, we ought to endeavour to waſh away the poiſon, by pouring water upon it out of the ſpout of a tea-kettle from a conſiderable height; and, indeed, it will be proper to perform this ablution, even though the part has been cut out. As the poiſon is of a viſcid nature, it will alſo be proper, during the waſhing, now and then to wipe the wound gently with a bit of ſoft rag, to abſorb the ſaliva, which might otherwiſe not be diſſolved by the water. After this is done, it will alſo be proper

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to keep the wound from healing as long as poſſible, if it can be done with ſafety to the patient, even for a twelvemonth, or more. If, however, the wound has been already healed, and the patient has ſigns of an hydrophobia coming on, the ſame method of treatment ought to be uſed; and, even then, there are hopes of ſucceſs. In the ſixth volume of Medical Commentaries, we have a very ſurpriſing inſtance of the efficacy of this method. A woman being bit in the ancle by a mad dog, eſcaped the diſeaſe for that time, by the wound being long kept open. Every year, however, the cicatrix broke out again, and was again kept open for ſome time; and thus ſhe continued free of the diſeaſe for no leſs than *eighteen* years; and yet, after ſo long time, on neglecting her remedy, ſhe was ſeized with the hydrophobia, but recovered, as appears, principally by blood-letting. There are likewiſe great numbers of inſtances, in which people, who have been bitten, never were ſeized with the diſeaſe, if the wound, inſtead of healing, changed into an ulcer which could not be healed; inſomuch, that, in ſuch caſes, we might generally venture to give a favourable prognoſtic. We cannot, however, ſay as much for any artificial evacuation; and it is evident that there muſt always be this eſſential difference between them, that, where the wound feſters naturally, the ſyſtem is certainly

certainly offended by the poiſon itſelf, and therefore makes an effort to throw it off, in which there is no reaſon to doubt that it will be ſucceſsful; but, in any artificial diſcharge, an effort is made to throw off the irritating ſubſtance, or the parts deſtroyed by it; ſo that the diſcharge of the poiſon is to be conſidered as accidental, rather than any thing elſe.

Beſides this external treatment, it is natural for us to enquire whether ſome medicines of the internal kind may not be advantageouſly uſed in conjunction with it; though, from the caſes already quoted, as well as from a great many others, it appears that, by themſelves, they cannot be depended upon. To determine this, if poſſible, I have fully conſidered the treatment of this diſeaſe, from the time of Galen, to the preſent day; and it appears plain to me, that all phyſicians have treated it as an inflammatory diſeaſe; and, in conſequence of this, they have truſted entirely to remedies of the antiphlogiſtic kind, ſuch as blood-letting, the warm bath, violent vomiting, excited by the ſtrongeſt emetics. Of late, indeed, they have intermixed with theſe medicines of an oppoſite kind, ſo that the whole treatment frequently made up ſuch a farrago, that it is impoſſible to ſay what the intention of the phyſician was, or, indeed, whether he had any intention at all. Thus, we find opium, bark,

bark, camphire, muſk, &c. tried without any benefit. Mercury, in ſome caſes, has been ſaid to be ſucceſsful, while, in others, though perſevered in to ſuch a degree as to produce a ſalivation for *forty days*, the patient has at laſt been ſeized with the diſeaſe, and frequently died on the ſecond day after the attack. In this diſeaſe, I think, with Dr Ruſh, and ſome other practitioners, that there is a ſurpriſing reſemblance to the tetanus. We are informed that the firſt ſign of an approaching hydrophobia is a dull heavy pain in the parts adjacent to the cicatrix, attended with a kind of numbneſs, while the ſcar itſelf ſwells, and becomes hard. The pain and numbneſs gradually proceed upwards to the ſhoulder, neck, and temple, if the wound has been in the hand. The muſcles of the throat then become affected with excruciating pain; and the patient begins to feel a difficulty in ſwallowing liquids, and reluctance at attempting it. This ſevere pain attacks not only the muſcles of the throat, or thoſe which ſerve for deglutition, but likewiſe the diaphragm, and thoſe of the forepart of the trunk, pulling the head and breaſt forward. All theſe ſymptoms, as in a tetanus of the worſt kind, continue to increaſe, till, during the fits, the whole body becomes, as it were, convulſed with grievous pain. At this time, the patient's countenance is full of horror, and his eyes

eyes look red and furious, continuing to do ſo all the time that the fit continues. When this goes off, the patient relates his ſufferings, and complains greatly that he is tormented with thirſt, though the pain that water gives him is ſo great, that he would rather die than attempt to drink. Some patients, indeed, have had the reſolution to conquer this extreme averſion to liquids, and have forced themſelves to ſwallow large quantities thereof, but all to no purpoſe; for, though violent vomiting has enſued, the ſtomach could never be cleared of the frothy mucus with which it is conſtantly filled in this diſeaſe; and they have expired in as ſhort a time as thoſe who did not attempt to drink at all.

Conſidering the hydrophobia as ſo nearly allied to the tetanus, what I have already ſaid of the latter ſuperſedes, in a great meaſure, what I might otherwiſe have ſaid of the hydrophobia. Suppoſing both diſeaſes to be the effects of extreme debility, I muſt recommend the ſtrongeſt tonic medicines; or rather, if poſſible, to induce a phlogiſtic diatheſis throughout the whole ſyſtem. From the hiſtories of ſome caſes, we have reaſon to believe that this might prove ſucceſsful. A girl, who had been bit by a mad animal, took a mixture of muſk and cinnabar, by way of preventative, till on the 62d day ſhe was ſeized with the diſtemper, and died in three days.

A woman who was pregnant, and had been bit the ſame day, took the ſame medicine, and eſcaped the diſeaſe. Now, from the caſe of the girl, we ſee that the medicines availed nothing; ſo that here we muſt attribute her eſcape to her pregnancy; and, as in that ſtate we know that the blood has a ſtrong tendency to inflammation, it is moſt probable that the poiſon was thus reſiſted, and at laſt thrown out of the body. Another caſe, ſtill more to our purpoſe, is that of a woman who was taken ill on the 40th day, and drank two bottles of brandy, by which ſhe recovered. She would taſte no other liquor, but was at laſt perſuaded to add an equal quantity of oil to her brandy, and had every day two boluſes of caſtor and opium, by which means ſhe recovered. Now, taking the hint from this caſe, we have certainly every reaſon to conclude, that, if any medicines are likely to be of ſervice in the hydrophobia, they muſt be ſuch as will tend to bring on a phlogiſtic diathefis throughout the whole ſyſtem. The pulvis antilyſſus of Dr Mead is certainly of this kind, though he himſelf ſeems not to have known of it, and to have truſted to the lichen cinereus terreſtris, which is probably inſignificant; while the virtue of the whole depended on the pepper. My practice in theſe caſes, in ſhort, would be as follows. *Firſt*, I would adviſe the piece to be entirely cut out, (a ſcalpel

is the beſt inſtrument for the purpoſe), and the wound kept open for a very long time. In the *ſecond* place, I would adviſe the patient to uſe a nouriſhing diet. *Third*, If the patient is young and healthy, he ought to bathe every morning, either with a ſhower bath, or in a pool of a river of ſuch depth, that, when he leaps into it, the water may cover him at once; or, he may have a large tub full of water for the purpoſe. *Fourth*, He ſhould frequently take a glaſs of brandy, in the bottle of which an ounce and an half of bark has been infuſed, ſhaking the bottle every time the glaſs is taken; and every thing muſt be done to bring on and keep up a gentle phlogiſtic diatheſis. *Fifth*, If the patient ſhould be attacked with the diſeaſe, I would then have recourſe to ardent ſpirits in larger quantities, with a view to raiſe the pulſe, which in the hydrophobia is always low and feeble, uſing opium in large quantity at the ſame time, ſhould the ſpirits prove ineffectual.

The wounds made by poiſoned weapons are undoubtedly no leſs dangerous than the bite of the moſt envenomed ſerpent. Indeed, if we may believe Dr Mead, they are the very ſame; for he tells us, that the Indians dry the poiſon-bladders of thoſe deadly ſerpents called *cobra de capello*, and grinding them to powder, make it up into a paſte, with which they anoint their arrows.

arrows. Mr Bancroft, in his natural hiſtory of Guiana, informs us, that the arrows with which the Indians in that part of the world hunt wild beaſts are anointed with a vegetable poiſon, which, however, proves no leſs fatal than the moſt violent of the animal kind; and it is ſaid that the fleſh of the animal killed in this manner becomes very ſoft and tender, owing to an incipient putrefaction, which inſtantly takes place throughout the whole body. As the Indians never employ theſe weapons in war, the effects of it on the human body are not well known. Mr Bancroft, however, had an opportunity of ſeeing an Indian, whoſe ſkin had accidentally been ruffled by one of theſe poiſoned arrows, but without drawing blood. On this he conſulted with ſome of the moſt intelligent people he could find, but they aſſured him that they knew of no remedy for the poiſon; but added, that the Indian would not die, as no blood had been drawn. The event verified their prediction. A violent inflammation enſued in the limb which had been ſcratched, and an equally violent inflammatory fever threatened the deſtruction of the patient; but he got better next morning. Hence we may conclude, that this poiſon operates in a manner ſimilar to that of ſerpents, and, when in ſufficient quantity, admits of no cure; as death comes on ſo quick,

that

that none could be applied, even if it were known. M. Fontana informs us, that a ſmall quantity of ſolution of this poiſon, injected into the vein of an animal, killed it like lightning, even before he thought that the injection had time to paſs from the ſyringe. As to a cure, he does not mention any; and indeed, in caſe of an accidental wound with any of theſe arrows, the only thing that ſeems to have the ſmalleſt chance of ſucceſs, is the ligature, and ſucking out the poiſon. This may indeed ſeem a dangerous operation; yet, from the concurrent teſtimony of authors, we find that has been performed with ſucceſs. Of this we have a remarkable inſtance, in Edward I. of England; who, having been accidentally wounded with a poiſoned arrow, his queen ſucked out the poiſon, and thus ſaved her huſband's life, without hurting herſelf.

It is not known, what other poiſonous ſubſtances may produce deleterious effects when mixed with the blood; nor, indeed, can this be known without a great number of experiments, for the cruelty of which, it is very doubtful, whether the addition made by them to ſcience, could make ſufficient recompence. Oil of tobacco, inſerted into a ſmall ſcratch of the body of a fowl, will kill it in a very ſhort time; but whether it would have the ſame deleterious effects

fects upon large animals, or on the human ſpecies is not known. Mineral poiſons are not found to exert their malignant properties, unleſs taken into the ſtomach.

Beſides theſe poiſons, all of which are foreign to the human body, there are others, which in ſome caſes are greatly to be dreaded, and that ariſe from diſeaſes of the body itſelf. Of this kind we might reckon the contagion of the plague, and other infectious diſeaſes; but, as theſe cannot be prevented by any external application to the body, we muſt refer them to the conſideration of the phyſician. Another poiſonous matter, of which ſurgeons and anatomiſts have frequently felt the baneful effects, is the ſanies, or corrupted matter of a body, dead of a peſtilential or putrid diſeaſe. When this happens to get into any ſmall wound in the fingers, or, if the ſurgeon happens to cut himſelf ſlightly with the diſſecting knife, in opening one of theſe bodies, the conſequences have been often very dangerous, and even fatal; by reaſon of the putrid ferment mixed with the blood. In this caſe, the ſame remedies muſt be applied, as when a gangrenous diſpoſition of the juices is induced from any other cauſe. Whether in this caſe, the application of a ligature, when the ſymptoms begin to appear, could be of any ſervice, may deſerve conſideration; waſhing the wound

wound well, and enlarging it, that the poiſon might be the more perfectly got out. If, after this, *ſucking* could be of any uſe, this might be done by the perſon himſelf.

Wounds may alſo be poiſoned, as we have ſaid, by the ſanies of venereal or cancerous ulcers. There are ſome inſtances where a ſurgeon, having a ſmall wound in his finger, which he did not obſerve, has been infected in the dreſſing or removing a cancerous tumour, and very troubleſome ulcers have enſued, attended with great pain, burning heat and tenſion over the whole hand and fore arm, which often cannot be removed but by the amputation of the arm, nay ſometimes deſtroy the patient altogether. In all theſe caſes, as ſoon as there is the ſmalleſt reaſon to ſuſpect an infection, I would recommend the cutting out of the part inſtantly, or burning it out with a large proportion of cauſtic, put not only over the ſmall wound, but likewiſe the ſound ſkin, next the heart, for a quarter of an inch. Thus the dangerous ſymptoms that take place on the introduction either of the venereal virus, or any other, may be prevented at firſt; or, if this ſevere method be diſliked, we may have recourſe to the ligature, dilating the wound, waſhing and ſucking as already recommended. Theſe attempts to prevent the introduction of any poiſonous matter into the ſyſtem ought never to be neglected;

neglected; for we know, from repeated experience, that the venereal virus, when directly mixed with the blood and other juices of the body in this way, cannot be expelled but at the risk of the patient's life. There have also been melancholy instances, as already hinted, where persons of great abilities have lost their lives, by wounding themselves in opening the bodies of those who died of putrid diseases. Such as are employed in this way ought to wash their hands in the best vinegar before they proceed to the operation; and, if there is any part of the skin broken, however small, the smart of the vinegar will make them sensible of the necessity of guarding that part against the poison. If they feel several parts of their hands smarting, it will be prudent for them to forbear the operation, and cause some other person do it, the skin of whose hands is whole; at the same time, the utmost caution ought to be used in dissection, not to wound the hand or fingers; and the operator ought never to be rash in cutting, both for his own sake, and that of his assistant.

SECTION

## SECTION V.

### *OF GUNSHOT WOUNDS.*

INJURIES of this kind are at all times ſo much more difficult to be healed than wounds made by a ſharp weapon, that it has been ſuppoſed they alſo were of a poiſonous nature. This notion, however, is now univerſally allowed to be erroneous; and the violent effects produced by them are, with more juſtice, aſcribed to the exceſſive contuſion and laceration of the parts from the amazing impetus of the ball. Theſe wounds, however, dangerous as they are, vary exceedingly, according to the nature of the wounding body. A cannon ball, for inſtance, muſt make a more dangerous wound than a muſket or piſtol ball, on account of its ſize. There will alſo be ſome difference according to the metal of which the ball is made. Thus a leaden ball may flatten itſelf upon a bone, which another made of iron, braſs, or copper, might penetrate entirely. Theſe laſt, again, if allowed to remain long in the wound, might, by a diſſolution of the metal, produce various ſymptoms, different from thoſe which would have taken place otherwiſe. The moſt

moſt dangerous of them all, however, are thoſe made by ſtones, broken pieces of metal, or other irregular ſubſtances; for theſe, having an equal, or not much leſs force than the round bullets, muſt certainly lacerate much more grievouſly than any round bullet can do. The ſame danger, ariſing from the nature of the wounded parts themſelves, alſo takes place, in a greater degree, in gunſhot wounds than in others. In theſe kinds of wounds there is likewiſe much more difficulty in getting out the extraneous bodies, than in others. Thus, even leaden bullets are often very difficult to be got out; and there are inſtances of their having been lodged in the body for many years; which, however, cannot be the caſe with bits of ſtone, glaſs, or other irregular bodies; as theſe, by their corners, continually wound and irritate the parts. Part of the clothes alſo being driven in by the bullet, are often difficult to be got out, and occaſion many diſagreeable ſymptoms. Hence the moſt troubleſome and dangerous ſymptoms are frequent in gunſhot wounds; ſuch as violent inflammation, hæmorrhage, fever, palſy, gangrene, and waſting ſuppurations; all of which are augmented or diminiſhed according to circumſtances already mentioned. The wounding bodies are, as we have ſaid, balls of iron, lead, braſs, or glaſs, &c.; and we have ſhown how there muſt

be a very great difference, in point of danger, according as the one or the other is uſed. Leaden balls are the leaſt pernicious; and the moſt favourable gunſhot wound is by a leaden bullet fired point-blank; for, if it hits upon any ſolid body, and afterwards rebounds from it, the flattening of the bullet makes the wound much more dangerous than it otherwiſe would have been. Every ball has alſo ſome kind of points or roughneſs from the mould in which it is caſt; and theſe points are evidently the more dangerous in proportion of the hardneſs of the metal. Glaſs balls are much more dangerous than any metal; becauſe they may break in the wound, and, by ſcattering the pieces about through the adjacent parts, may do inconceivable miſchief. From all theſe conſiderations, we may conclude, that gunſhot wounds are conſtantly of the contuſed and lacerated kind, and ought therefore to be treated in the manner directed for injuries of that ſort.

When a ſurgeon is called to a patient having a gunſhot wound, the firſt thing he muſt do, is to prevent the fatal effects of hæmorrhage, in caſe any large blood-veſſel is wounded. If the wound is ſituated in any of the extremities, a tourniquet, ſuch as is repreſented Pl. 1. Fig. 1. will be found effectual for the purpoſe. It muſt be made with a piece of ſtrong leather, having

two

two openings in it, at two inches diſtance from one another, and each of them one inch and an half long. Through theſe ſlits we muſt paſs a ligature, of the ſtrong binding called coarſe linen tape. Each end of this ligature is to be put round the limb, ſo that it may be entirely ſurrounded with it; after which, the two ends are to be put through the openings in the leather, in ſuch a manner as to form a double circle round the limb, and to be eaſily tied upon the outſide of the leather. A ſmall turned wooden pin, about ſix inches long, is to be introduced between the bandage and the leather; and, in this way, it is to be twiſted round, till the hæmorrhage is certainly ſtopped. An inſtrument of this kind is called the common tourniquet. If either the brachial artery be wounded high up near the middle of the arm, or the crural artery about ſix inches below its paſſage out of the groin, we ought inſtantly to make an inciſion through the ſkin, and cellular ſubſtance, and faſcia of the thigh, ſo that both ends of the wounded artery may be completely expoſed to view; and, as ſoon as this is done, each of them is to be ſecurely tied, as in the operation for an aneuriſm. The brachial artery is to be treated in the ſame manner; and thus, may frequently ſave not only the patient's life, but his limb alſo; particularly in wounds of the crural artery. In this way, we may tie it even higher up than could

could be done in cafes of amputation, and yet fave the limb. If any fmall artery happens to be wounded, we need fcarcely put the patient to the trouble and pain of laying it open, and taking it up with the tenaculum; common ftyptics applied to the wound will generally be fufficient. The beft vegetable ftyptics, are the lycoperdon vulgare, or common puff-balls, agaric of the oak in thin flices, or a powder made from the dried agaric *; or the ftyptic powder of the Edinburgh Pharmacopeia. Having filled the wound with fome of thefe ftyptic powders, we muft compref and keep the powder in its place, by fmall folds of linen put over it, raifed by degrees above the level of the fkin, then covering it with two or three folds of a linen compref, faftening the whole with a circular bandage. In thofe parts of the body, where the tourniquet cannot be applied, their trunks ought to be compreffed by the fingers of an affiftant, while the arteries are taken up and tied by the furgeon.

Having fully ftopped the hæmorrhage, the next thing to be done, is to remove the extraneous bodies, which is very often a matter of no fmall difficulty. Where a leaden ball, however, has penetrated by itfelf, to a confiderable depth among the mufcles, we ought by all means to

* That is, fuch as is taken either from cafks which have ftood a long time in damp cellars, or from the benches which fupported them.

to allow it to remain; for there are innumerable inſtances, where wounds of this kind have healed up kindly, and the ball has been lodged in the body during life, without the ſmalleſt inconvenience. But, where balls of braſs or copper, or angular and very irregular bodies, or bits of cloth, have been forced into the wound, we muſt uſe our utmoſt endeavours to remove them; for the ruſt of iron or braſs is found to produce not only great uneaſineſs to the patient, but ſuch a train of bad ſymptoms as would deſtroy him. In ſuperficial gunſhot wounds, where the ball has made one opening by its entrance, and another by its exit from the body; if any bit of cloth, or other extraneous ſubſtance, ſhould be obſerved in it, we muſt lay it open through the whole extent, by means of a probe-pointed biſtoury; then having removed, as well as we can, theſe extraneous ſubſtances, we muſt cover the wound with a pledgit ſpread with very mild ointment, laying over all a compreſs of ſeveral folds of linen, retained by a roller. But, when the ball has penetrated to a great depth, and lodged itſelf in the fleſh, we muſt then conduct our examination of the wound with great caution and delicacy; and, if the extraneous ſubſtances cannot be brought through the paſſage which they themſelves have made, without injuring the nerve or muſcles, they muſt be allowed

lowed to remain, eſpecially if we cannot feel them on the ſide of the limb oppoſite to that on which they entered. Sometimes, however, the force of the ball is ſo much ſpent, that it paſſes through the muſcles on both ſides, without being able to penetrate the cellular ſubſtance and ſkin, on that oppoſite to which it entered; and in theſe caſes we may ſafely cut upon the bullet and remove it. There are, indeed, many inſtances of bullets having been lodged many years, without inconvenience, in the muſcles of the ſcapula, or upon the ribs; in the fleſh of the arms, buttocks, ſcrotum, legs, or thighs; but, in moſt of theſe, the lodgment was ſuperficial, and the balls might have been eaſily removed; and, where this could be done by a ſlight inciſion in the ſkin, it ought always to be done; and done at the firſt; becauſe the patient will not ſo willingly undergo a ſecond painful operation.

When a ball ſtrikes upon a bone, the latter is ſometimes ſo much injured, that ſplinters are broken off from it, without making a complete fracture of the body of the bone itſelf. If the fragments are completely detached, they ought to be conſidered as extraneous ſubſtances, and removed along with the reſt; but, as it would be very difficult to remove them in a deep wound, where they are ſtill covered with the periofteum, they

they may be allowed to remain. In ſuch caſes, however, it has ſometimes happened, that theſe pieces have become carious, and been thrown out of the wound, ſeveral years after it was healed. The only thing that can then be done, is to aſſiſt nature in throwing out the diſeaſed part of the bone, by a ſlight operation; and it would be unjuſt to aſcribe this breaking out of the wound to any want of ſkill in the ſurgeon who treated it at firſt; the true reaſon is the want of circulation in the ſplintered part, which could not afterwards be reſtored. Again, when a bullet lodges in the ſubſtance of a bone, as in the condyles of the femur, or large head of the tibia, or in any other bone where the lamella are ſeparated by a large diploe, it ought by all means to be removed, on account of the violent inflammation, tenſion, and great pain, which take place in theſe caſes; though much difficulty is often experienced in doing ſo, by reaſon of the firmneſs with which it ſticks in the opening it has made; for, it will frequently be found that the paſſage which a bullet makes for itſelf, when diſcharged with violence through a ſolid body, will not be ſufficient to allow it to go through again, even though we uſe conſiderable force. This is always ſeen when a bullet is ſhot through a door; and the reaſon ſeems to be, that the fibres of the wood, being conſiderably elaſtic, partly

partly yield to the violent impetus of the ball, and immediately recover themſelves, by which the aperture is greatly diminiſhed. This diminution of the aperture is moſt perceptible when part of a candle is driven through a door.

Where the orifice happens to be ſo much diminiſhed that we cannot extract the ball by the paſſage through which it entered, we ought to allow it to remain in the wound, until, by the ſuppuration, a paſſage is made for it ſufficiently wide to allow of the extraction by its own gravity, or aſſiſted by a ſmall degree of force.

A great number of forceps have been invented, and plans for many others ſuggeſted, for extracting bullets; it muſt, however, be evident, that, where the bullet can either be felt or ſeen, the beſt method of extracting it is by laying open the wound; which, if it do not exceed ſix inches in length, may be done by a probe pointed biſtoury. But, in very deep wounds, or large ſuperficial ones, where the ball has paſſed under the ſkin for twelve or fourteen inches, inſtead of ſearching for it by the orifice through which it entered, we ought to feel on the oppoſite ſide; or, having aſcertained the direction which it took, we are to feel for the ball along that direction; and, having found it, an inciſion ought inſtantly to be made upon it, when it may be turned out with the finger, or with the end of the wooden

handle of the ſcalpel. In doing this, however, we muſt be cautious of injuring any blood-veſſel or nerve; but, though we ſhould be obliged to cut through the firſt layer of muſcles, no bad conſequences would enſue, provided the cut is made in the direction of their fibres.

Having, in one or other of theſe methods, cleared the wound of all extraneous ſubſtances, we muſt next proceed to the dreſſing. This ought to conſiſt of a pledgit, ſpread with any very mild kind of emollient ointment, with a poultice over it; by which means, the pain and irritability, which almoſt conſtantly attend wounds of this kind, will be conſiderably diminiſhed. The poultice ought frequently to be changed; and, in caſe the ſwelling and tenſion ſhould increaſe to any conſiderable degree, we ought to cover the parts below the poultice with Goulard's cerate. If the inflammatory ſymptoms do not forbid it, we ought alſo to give an opiate every night.

The next conſideration of the ſurgeon, in wounds of this kind, is to prevent inflammation as much as poſſible; and he will always find it much more eaſy to *prevent* the inflammatory ſymptoms from riſing to any height, by carefully watching the patient from the time he is put under his care, than to *cure* them after they have been allowed to come on. In all fleſh

wounds, where no conſiderable veſſel is divided, it will always be found advantageous to allow the wound to bleed freely; the patients who labour under this ſpecies of wounds being generally in the prime of life, when inflammations are apt to run to a great height, if not carefully attended to. When the bullet happens to paſs quite through any of the limbs, without touching the bone, or any large blood-veſſel, it would be improper to dilate the wound, but to cover both orifices with a pledgit of mild ointment, and a poultice as directed. If great inflammation and pain come on, we ought to take away blood, by cupping and ſcarrifying about the inflamed edges of the wounds, and encourage the flux as much as poſſible. Leeches would be preferable; but they are ſeldom to be had where gunſhot wounds are moſt frequent. Topical bleedings, indeed, will always be found of the utmoſt utility; and, if the patient has not loſt a great quantity of blood at the time the wound was inflicted, frequent and large general bloodlettings will be found uſeful. Where the wound is of a bad kind, it will generally be found proper to take away as much blood topically as the patient's ſtrength can bear; for, in proportion as we thus diminiſh the inflammation, we likewiſe diminiſh the ſuppuration, and conſequently the diſcharge of matter, which is often

much

much to be dreaded. It very often happens, however, that, by reaſon of the extreme violence with which gunſhot wounds are inflicted, little or no blood flows from the wounded veſſels at the time of receiving the injury, and that even though ſome conſiderable blood-veſſels are wounded. In theſe caſes, a mortified ſlough is very ſoon formed, all over the inſide of the wound; and, though little or no blood be loſt in the field, or even for ſome days after the wound is received, yet, when this ſlough ſeparates, the blood has then free exit from the veſſels; and, if proper attention be not paid to this particular, a very copious hæmorrhage may ſometimes take place; which, if not attended to, or ſtopped in time, by proper ſtyptics and compreſſes, the patient's life may be endangered. The danger of hœmorhages of this kind takes place from the fifth to the ſeventeenth day, during which time the nurſes or attendants ſhould be very careful; and, until the danger be over, a common tourniquet ſhould be conſtantly applied, and kept on the limb ready to be twiſted, ſo that the blood may be ſtopped either by the patient himſelf, the nurſe, or the aſſiſtant.

Along with theſe precautions, the patient ſhould be kept on a low diet, and antiphlogiſtic regimen; which will not only render the inflammation very trifling, but alſo diminiſh the danger

ger of an hæmorrhage, which could not be the caſe formerly, as will appear from the following account of the uſual method of proceeding. Having laid open the wound as much as was thought ſufficient for removing the extraneous bodies, they filled it with ſmall doſſils of caddice, or dry charpee, covered over with a plaſter of diachylon, and above all a large compreſs kept on by a moderately tight bandage. Thus it was left for three days, during which time, if any conſiderable degree of ſwelling took place round the wound, they frequently moiſtened the parts round the wound with ſpirituous reſolving waters; taking care, however, that none of them ſhould enter the wound. After the third day, the wound was dreſſed for the ſecond time; and, if any of the doſſils were found adhering to it, they were not to be taken away, but left till they ſhould ſeparate of themſelves. Doſſils were again introduced, but not dry as before; being now anointed with baſilicon, ung. arcæi, or any healing digeſtive ointment. Thus the wounds were dreſſed; and thus it was evident that they muſt frequently terminate in gangrene, as well from the ſtimulus of the dreſſings, as from the ſeverity of the wound; and, ſo true is this obſervation, that the edges of the wound were frequently found in a ſtate of mortification at the very firſt removal of the dreſſings. This method,

thod, however, has for ſome time been laid aſide, and, inſtead of dry dreſſings, mild emollient ointments have been made uſe of; by which means the patient is now freed from much danger, as well as pain.

If a free and full ſuppuration ſhould not take place after we have reduced the ſwelling and tenſion very conſiderebly, and the patient ſhould ſtill complain of much pain and uneaſineſs about the wound, a pledgit ſpread with Goulard's cerate may be applied with advantage at every dreſſing. The formation of laudable pus is indeed a matter of the utmoſt importance in every contuſed wound; for, until this takes place all over the ſurface of the ſore, great danger is to be apprehended, particularly if any ſymptoms of gangrene ſupervene after blood-letting, both general and topical, has been uſed as freely as the patient's ſtrength can bear. We ought then to repeat the poultice frequently, until the ſuppuration be complete, and the bottom of the wound has an healthy and ſound appearance. The poultice muſt then be removed, and the ſore dreſſed as already directed; and, by proceeding in this way, it is obvious that the eſchars or mortified ſloughs will be ſeparated in proportion to the ſuppuration which takes place over the ſurface of the wound; and indeed this is the only way by which they can be thrown off and cured.

cured. The quantity of matter diſcharged will generally be in proportion to the extent of the ſurface of the wound, but more particularly to the ſize and extent of the ſwelling round the edges, and the pain in the adjacent parts. If the ſwelling and pain have been very conſiderably diminiſhed, the diſcharge of matter will alſo be diminiſhed in proportion; but, if in any caſe the quantity happens to be too great, and it has penetrated into the interſtices of the muſcles, or to a conſiderable depth in the cellular ſubſtance, we muſt open every collection of it in the moſt depending part as ſoon as poſſible; putting a compreſs over the places where thoſe collections were, every time the wound is dreſſed; making the ſides of the cavities keep in contact with each other, by means of a gentle preſſure, and keeping the limb in the moſt favourable poſition we can, for giving inſtant vent to the matter; ſo that we may not again have any occaſion to renew the poultice.

In this ſtage of the diſeaſe, the patient muſt be ſupported by nouriſhing food, along with which a certain proportion of wine, or other cordial liquor, muſt be given. During this time alſo, the bark ought to be given in ſuch quantities as the patient can bear, not leſs than half an ounce in the twenty-four hours; but, if it agrees well with him, the quantity may be doubled; waſh-

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ing down each dose with a glass full of water, containing thirty drops of elixir of vitriol. If, notwithstanding this, the discharge continues very great, we may justly suspect that the wound still contains some irritating substance, particularly if any considerable degree of pain still continues, without yielding to opiates, which are generally found of much use in gunshot wounds.

Formerly, it was customary with surgeons, not to lay open the whole of a gunshot wound, but only as much as they thought was sufficient to allow a free exit to the matter; scarifying the inside afterwards, as much as they could, over the whole surface, in order, as they thought, to promote the separation of the sloughs. Along with this, they used also the hottest and most stimulating dressings; which they also considered as necessary to promote the suppuration. But repeated experience has now convinced us, that such practice, instead of conducing any thing towards the cure, directly militates against it; because, thus the inflammatory symptoms, always apt to run too high, are greatly increased; and consequently, at the same time, the tendency to mortification is increased in proportion. A certain degree of compression is therefore always to be employed, as soon as the wound is cleared of all extraneous substances, even though there should still be a considerable discharge of matter,

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and the wound ſituated pretty deep among the muſcles, ſo that it cannot be fully dilated. Where the wound terminates in gangrene, in ſpite of all our efforts to ſuppreſs the inflammatory ſymptoms, we muſt treat it in the manner directed in the firſt volume of this work. To the remedies there mentioned, however, we may add the following; viz. a bolus of ten grains of muſk, with an equal quantity of volatile ſalt, repeated every three hours till the ſymptoms abate. Charles White, Eſq; ſurgeon in Mancheſter, has uſed this remedy in five different caſes of wounds, with the happieſt effects. One was, after the operation of lithotomy had been performed, and where the inflammatory ſymptoms had run high from the firſt, with great pain and tenſion in the abdomen. The uſual antiphlogiſtic courſe was perſiſted in till the ſixth day, when an hiccup came on; the wound ſtill continuing in an undigeſted ſtate. He was then ordered a table ſpoonful of a muſk julap, containing about eight grains of muſk, every three hours. After the ſeventh day, the wound began to digeſt, the hiccup became leſs frequent, and the ſymptoms continued favourable till the 27th day, when they returned with amazing violence. His pulſe now roſe to 140 in a minute, his ſkin dry, the the tongue hard and brown, belly greatly ſwelled and emphyſematous, the wound black and

mortified, with conſtant hiccup, and ſubſultus tendinum. In ſuch a ſituation, no hopes of his recovery could reaſonably be entertained; nevertheleſs, with a view to mitigate, in ſome degree, the ſeverity of the ſymptoms, a bolus of ten grains of muſk, and as much ſolid volatile alkali, was ordered him. The firſt day he could take no more than four boluſſes; and no change could be perceived for the better, but that he had now a little moiſture on his ſkin. In two days the ſymptoms becoming ſomewhat more favourable, he was prevailed upon to take a double quantity of the medicine, and the event was anſwerable to expectation. In two days, his delirium went off, and, by the 35th day, all the bad ſymptoms diſappeared. The ſecond caſe was of a man, 46 years of age, who had a compound fracture of the leg; which, after much pain and tenſion, became livid on the 5th day; and, though the bark was given in conſiderable quantity, it ſoon mortified. The pulſe ſoon roſe to 140 in a minute, with other ſymptoms reſembling theſe of the former; only that in this caſe the patient, along with his delirium, had a wildneſs in his look. On the eighth day, he took the bolus of muſk with volatile alkali, and the firſt night after taking it ſlept better than he had done ſince the accident, having alſo a gentle perſpiration. The bolus was continued until he had

had taken two ounces and an half of muſk, and as much volatile alkali; but, from the violence of the injury, ſuch a ſloughing took place, that he did not perfectly recover his health in leſs than nine months. The third caſe, was of a woman of forty years of age, who had an eryſipelas; and, on the third day of the attack, was ſeized with great drouſineſs, delirium, ſubſultus tendinum, nauſea, and quick pulſe; her face, at the ſame time, being much ſwelled and livid. An aperient opozem, with nitre, was ordered to be taken occaſionally; and a bolus, with ten grains of muſk, and an equal quantity of confectio cardiaca, repeated every five or ſix hours. As the nauſea and delirium ſtill continued, ſhe was ordered two tea ſpoonfuls of the camphor julep, with vinegar inſtead of water, frequently through the day; the bolus being alſo continued, but now made into pills. In two days ſhe appeared ſo much relieved, that the muſk was diſcontinued; but, next day, though the bark had been exhibited in conſiderable quantity, her face became more painful than before. Some relief was obtained by anodyne fomentations; but, next day, all the bad ſymptoms returned; her face became more livid, the delirium run high, the ſubſultus became very frequent and troubleſome, and the pulſe roſe to more than 130 in a minute. Ten grains of muſk,

muſk, with five of voltale alkali, were then ordered in a bolus, to be repeated as often as ſhe could take it. Next day, ſhe was ſenſibly relieved; her ſleep had been more natural; there was ſome moiſture upon her ſkin; and the day after, ſhe was quite free from delirium and ſubſultus tendinum. All the bad ſymptoms left her in a day or two, and ſhe recovered perfectly in a ſhort time. The fourth caſe was a compound fracture of the arm, which, in a girl of fourteen, became completely mortified in two days after the accident; the mortification extending almoſt as high up as the ſhoulder; the ſwelling and inflammation extending ſtill farther, without appearing to be ſtopped in its progreſs; ſo that, conſidering the rapid advances made by the diſeaſe already, there ſeemed to be little hope of her ſurviving many hours. Twenty drops of laudanum were immediately given, and, ſoon after, a bolus of ſix grains of muſk, and three of voltale alkali, to be repeated every third hour. Next morning, the progreſs of the mortification ſeemed to be ſtopped; the muſk was increaſed to ten grains, and the volatile alkali to ſix. Of this, ſhe took eight doſes in twenty-four hours, not only without heating her, but with the happieſt effect in abating the ſymptoms. In ten days, the ſeparation of the mortified parts was far advanced; but, on omitting

ting the muſk, on account of its high price, and attempting to ſubſtitute the bark in its place, the bad ſymptoms returned; and the cure was not completed, until ſhe had taken two ounces of muſk, and nine drachms of ſalt of hartſhorn.

From theſe caſes, I think the efficacy of muſk and volatile alkali is evident in wounds where mortification has already come on, or where it is threatened. We muſt obſerve, however, that, where two medicines are joined together, we cannot eaſily determine which of them has the merit of the cure, or whether it is to be aſcribed to them both in conjunction. In the above caſes, it would have been a matter of ſome conſequence, from the mere *price* of the muſk, to determine whether the volatile alkali had any conſiderable ſhare in the cure; for, if it had, we may naturally ſuppoſe that it would have accompliſhed a cure by itſelf, without any muſk. Indeed, from the firſt caſe, it ſeems natural to conclude, that the muſk, by itſelf, was not able to accompliſh a cure; for, though it had been given, as would appear from the above account, for no leſs than three weeks, the bad ſymptoms returned with ſuch violence, as would probably have proved fatal, had not the medicine been exhibited again, with the addition of volatile alkali. The properties of this ſalt are known to be antiſeptic and ſtimulant in a great degree, though a long continued

tinued uſe of it will bring on a general diſſolution of the blood. In caſes, therefore, where there is a general tendency to putrefaction, and a great deficiency of the vital power, it is very probable that volatile alkali, eſpecially in its concrete ſtate, where it is joined with much fixed air, likewiſe a ſtrong antiſeptic, might be very ſerviceable. Bark is well known to be a medicine of the utmoſt importance and efficacy in caſes of mortification, and, as ſuch, is very commonly uſed in gunſhot wounds; but it would be abſurd to give it, merely on account of the mortified ſlough which covers the inſide of theſe wounds; for this always takes place, and very ſeldom communicates itſelf to the adjacent parts, but ſeparates from them as ſoon as a proper diſcharge of matter takes place. But, if after every attempt to diminiſh the inflammation, tenſion, &c. we ſhould ſtill be unable to prevent a gangrene, we muſt then apply every remedy from which we can reaſonably hope for any good effect. Theſe muſt always be of the tonic or ſtimulant kind; for, there is every reaſon to believe, that, as ſoon as a gangrene begins to appear in conſequence of a very high inflammation, the tone of the ſyſtem is reverſed; and that, from being in a ſtate of plethora, the veſſels are rather in a ſtate of callapſe.

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Hitherto, I have only taken notice of ſuch gunſhot wounds as afford a proſpect of a final and effectual cure, without leaving any remarkable permanent injury to the body; and, of this, we may always be in a manner certain, provided that the ſurgeon pays ſtrict attention to the rules already laid down. But, though this may be expected in fleſh wounds, or even in thoſe of the bones, where the injury is not very great, it cannot always be the caſe; as, for inſtance, in thoſe wounds of the extremeties, where the ball has not only paſſed through the fleſh, but the bone alſo. In theſe, after having examined the wound, ſtopped the hæmorrhage, if too great, removed every extraneous body, and cleared the wound of any ſplinters of broken bone, we muſt treat the limb according to the method recommended in caſes of compound fractures, applying the machine there deſcribed; and the patient ought to be blooded, if the ſymptoms of inflammation run high. In this caſe, we ought to have recourſe, both to general and topical bleeding; he ought alſo to be kept at firſt on a low diet; and, if much pain comes on, an opiate, proportioned to his ſtrength, ought always to be given, taking the utmoſt care to prevent all kind of irritation; and, as ſoon as there is any reaſon to believe that the violence of the inflammation is abated, an emollient poultice ought to be applied on each

each wound; but, as ſoon as a free diſcharge of matter is procured, the poultices muſt be laid aſide, and the wound dreſſed with pledgits, ſpread with fine liniment made of oil and wax, or Goulard's cerate; and, towards the end of the cure, when the granulations are well advanced, ſo as to be nearly equal with the ſkin, we ought to lay round the edges of the wound ſtraps of plaſter covered with cerate, about an inch broad; and, upon the middle of it, the healing liniment juſt mentioned ought to be applied. Throughout the whole courſe of the cure, every care muſt be taken to facilitate the conſolidation of the fractured bone, both by keeping the limb in a proper poſition, and the application of one circular bandage above the wound, and another below it. Nothing will ſo effectually prevent the formation of ſinuſes, as the judicious and proper application of a bandage, every time the wound is dreſſed; and the frequency of the dreſſing ought to be determined, by the quantity of matter diſcharged. If the diſcharge be great, the wound ought to be dreſſed once in twelve hours; but, if moderate, once in twenty-four hours will be ſufficient. Thus, if the patient be young and healthy, the loſs of bone will ſoon be ſupplied; and, if the machine with the ſteel ſplints be made uſe of, and properly applied, either to the leg or thigh, the ends of the bones will not only be kept

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at their proper diſtance, but firmly ſecured in their places till the cure be completed.

When gunſhot wounds penetrate any of the large joints, and, in paſſing through them, fracture the ends of the bones, it will then be found for the moſt part impoſſible, let the ſkill or abilities of the ſurgeon be ever ſo great, to preſerve both the life and limb of the patient. The reaſon of this is, that the acceſs of air to the cavity of the joint excites ſuch a violent inflammation as would certainly end in gangrene; and, therefore, for the moſt part, it will be proper, as ſoon as poſſible, to take off the limb. Indeed, in every caſe of compound fracture, whether produced by bullets or not, where the bones are much ſhivered, and the muſcles and ligaments torn in ſuch a manner, that no well founded hope of ſaving the limb can be entertained, it would be highly improper to perſiſt in vain attempts for that purpoſe; for thus the patient's ſtrength may be entirely exhauſted by the great diſcharge of matter, or he may be deſtroyed by an hectic fever, raiſed by the abſorption of the matter, ſo that even the amputation of the limb could not ſave his life. I am, however, far from adviſing any ſurgeon to amputate where there is a probability of ſaving a limb; nor is it any ordinary injury that can vindicate him for doing ſo. It is not enough that the bone be broke, and ſeveral of the frag-

ments of it driven into the ſurrounding fleſh; the muſcles themſelves being alſo penetrated and contuſed by the ball. If none of the ſplinters reach the length of the joint, ſo that there is no danger of expoſing the cavity of it to the air, if all the large veſſels are not wounded, or otherwiſe injured, ſo that the circulation cannot go on, no amputation ſhould ever be thought of in ſuch caſes; for Dr Aitken's machine, deſcribed in the chapter which treats of compound fractures, will alſo ſupport the limb properly, until the cure be accompliſhed. Nay, even when a ball has ſtruck the head of a bone in ſuch a manner as to fracture it completely, if the ball has fairly paſſed out through the other ſide, without injuring any of the large blood-veſſels, there is ſtill no reaſon to amputate immediately. Here we ought carefully to remove the looſe pieces of bone; and, if there be any conſiderable hæmorrhage from the ſmall arteries round the joint, it ought to be ſtopped, by applying powder of agaric to the mouths of the bleeding veſſels, and then filling up the wound with dry charpee; placing the limb in the moſt convenient poſture, and laying the patient as eaſy as poſſible. Several folds of lint ought then to be put over the charpee, of ſuch a ſize as exactly to fit the cavity of the wound; laying over the whole a large compreſs of linen, and retaining

the dreſſings with a proper bandage. If the patient has not loſt much blood, and be of a plethoric habit, we muſt have recourſe to bleeding freely at the arm, the wound muſt be covered lightly; and, if there be any conſiderable oozing of blood from the veins, it is proper to expoſe the wound entirely to the air, but without completely taking off the bandage and dreſſings. In caſes of hæmorrhage, we are not to employ any poultice, becauſe the flux of blood is increaſed by the heat of it; but, as the blood generally ſtops about the fourth or fifth day, and ſuppuration is then about to take place, we may lay on a pretty large poultice over the dreſſings, if they be found to adhere to the edge of the wound. After the dreſſings are completely thrown out, we muſt clean the wound gently with a warm moiſt ſpunge, and afterwards dreſſed with fine charpee, moiſtened in oil; and the whole to be covered with a large thick compreſs, and kept in its place with a proper bandage.

In a patient who happened to be put under my care for a gunſhot wound, the bullet had ſtruck and ſhivered to pieces the head of the humerus, paſſing through the body of the joint immediately below the end of the clavicle, paſſing over the brachial artery, as it paſſes over the firſt rib below the middle of the ſcapula, juſt below the ſkin, without hurting the artery, and

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was found lodged below that end of the clavicle which is articulated with the upper part of the ſternum. The ball being cut out, and all the ſhattered pieces of the head of the bone removed, the wound was dreſſed in the manner already directed. The dreſſings were removed on the ſixth day from their firſt application. Slight hæmorrhages took place now and then, but were always removed, by keeping the wound ſlightly dreſſed, and expoſed to the air. The patient was kept on a very low diet; and it was obſerved, that, on any hæmorrhage occurring, the pulſe became firmer, or beat quicker. By carefully dreſſing the wound in this manner, and allowing a nouriſhing diet when the hæmorrhage ſtopped, with ſome good Engliſh porter every day after dinner, he got quite well in two months, and his ſtrength and ſpirits became ſurpriſingly recovered. The ſuppuration continued very plentiful for near three weeks, during which time he took daily five drachms of Peruvian bark in powder, uſing at the ſame time a quart of porter, and a pint of Port-wine, together with thirty drops of the elixir of vitriol, in a ſmall tea-cupful of water, after each doſe of the bark. For the firſt five weeks, he had every night a large anodyne draught at bed-time; and while the diſcharge of matter continued very copious, the wound was dreſſed twice a-day. It

is now ten years ſince he received the ſhot; and he has at this moment the uſe of his fore-arm ſo completely, that he gains his bread as a ribbon-weaver. But, though we may ſucceed with this kind of treatment where the ſmaller joints are wounded, we cannot expect to do ſo where the cavities of the larger ones, ſuch as the knee or ancle, happen to be laid open. From my own experience, in caſes of this kind, as well as the teſtimony of the beſt chirurgical authors, I am decidedly of opinion that the limb ought to be immediately amputated. In every inſtance that I have ſeen or treated, where an opening is made into the knee joint, either artificially, or by accident, the joint inſtantly ſwelled, and the pain and fever became intolerable; ſo that, unleſs the limb was amputated without loſs of time, the patient muſt have periſhed. In all gunſhot wounds then, which penetrate the cavity of any of the large joints, amputation ought to take place as ſoon as poſſible, in the manner hereafter related, both as to the dreſſings and management.

SECT.

## SECTION. VI.

### *OF WOUNDS IN THE NERVES AND TENDONS.*

UNDER the head of Blood-letting, I have taken notice of the ſymptoms attending injuries of the nerves; and the ſame ſubject has been more fully taken notice of when ſpeaking of tetanus, and the other concomitants of wounds in the nervous and membraneous parts. The true cure, in all ſuch caſes, is to cut through the partially wounded nerve as ſoon as poſſible, before it has induced thoſe violent and generally fatal ſymptoms which have already been ſo fully treated of. Lacerations or wounds of the tendinous aponeuroſis of muſcles are likewiſe frequently attended with very dangerous ſymptoms; and the cure for theſe is the ſame with what we have already recommended for wounded nerves, viz. a free tranſverſe diviſion of the lacerated aponeuroſis, which ſets at liberty the adjacent parts that are commonly in a ſtate of great inflammation and tenſion. In the fourth volume of the Medical Obſervations, we have an account of a caſe of lacerated aponeuroſis, in which the diviſion of that membrane probably ſaved the life of the patient. The

wound was about an inch long in the flexure of the arm, and was occaſioned by a fall from a cart upon a flint. The faſcia of the biceps muſcle was torn, and part of it appeared in a lacerated ſtate through the wound. The immediate conſequence of this wound was a conſiderable hæmorrhage, which was ſoon followed by great pain, inflammation, and ſwelling in the arm. She was blooded, had a laxative medicine, the arm was kept in a bent poſition to relax the biceps muſcle, and had an emollient cataplaſm applied to it, but without any relief. Feveriſh ſymptoms came on, with a total inability to move the arm; and theſe complaints continued for a fortnight, accompanied with ſuch violent pain, that ſhe could not ſleep without opiates; and ſhe was likewiſe weakened by profuſe ſweats. A thin greeniſh coloured gleet was now diſcharged from the wound, the whole arm was indurated; and the patient complained that it felt as being bound tight with a cord. The diſeaſe being come to ſuch an height that the patient's life was evidently in danger, it was determined to try what could be done, by dividing the faſcia itſelf, in order to ſet the inflamed parts at liberty. An inciſion was accordingly made through the ſkin, cellular ſubſtance, and aponeuroſis, of about two inches in length; on which the faſcia inſtantly flew open, and the patient was as inſtantaneouſly

taneouſly relieved, the greeniſh coloured gleet was, againſt the very next dreſſing, changed for laudable pus; and the wound afterwards healed as eaſily as if it had been in any other part of the body, no other inconvenience remaining, but that of a little weakneſs.

From the caſe juſt now related, the author infers, that the grievous ſymptoms attending wounds of the tendons, and aponeuroſis of muſcles, ariſe more from the confinement of the inflamed parts, and from mechanical preſſure, than from any thing elſe. In caſes of wounded tendons, indeed, this may very probably be true, as we have an inſtance in this ſame volume, ſhowing to a demonſtration, that the tendons, however ſevere the ſymptoms attending a partial diviſion of them may be, are in truth totally devoid of ſenſation. The caſe was of a labourer, who, by ſome accident in loading a cart, had one of the joints of his middle and ring fingers torn off, ſo that the tendon of the perforans muſcle hung down for about half an inch from the wounded part. The ſurgeon, in order to make a deciſive trial whether this tendon had any ſenſibility or not, paſſed a piece of ſtring round the patient's wriſt, nearly of the ſize of the tendon, and made it project parallel to the ſtump, and about as far beyond it as the tendon did. He then told the patient that he intended to cut one of theſe with

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his ſciſſars, while he ſhould turn his head away, and then he ſhould inform him whether he had cut the ſtring or the tendon. The man laughed at this, as thinking he ſhould feel conſiderable pain on the diviſion of the tendon; but, inſtead of this, when the ſurgeon actually cut the tendon, the man thought that he had cut the ſtring, and declared that he felt not the leaſt pain while it was done.

It ſometimes happens that the ſtrong tendon, called the tendo Achillis, is ruptured by violent efforts in dancing, jumping, &c. in which caſe the uſe of the leg is inſtantly loſt. There are ſeveral inſtances of this accident having taken place; but we have none ſo particularly deſcribed as that of the late Dr Alexander Monro, Profeſſor of Anatomy in this city. This gentleman informs us that he had known ſixteen others to whom the ſame accident had happened in one or both legs; but, though in all of them a cure was in ſome degree accompliſhed, it was more complete in himſelf than in any of the reſt. When the tendon was firſt broke, he heard a loud crack, as if he had ſuddenly broke a nut with his heel; and he had ſuch a ſenſation, as if he had ſtruck an hole in the floor; and this ſenſation, he ſays, has alſo been felt by others, though ſome complained of a ſmart ſtroke like what would be produced by a ſtone or cane.

Having

Having inſtantly ſuſpected what was really the caſe, the Doctor extended his left foot, to which the accident had happened, as ſtrongly as he could with his right-hand, while, with the left, he preſſed downwards the muſcles of the calf, ſo that the ends of the divided tendon might be applied to each other as cloſely as poſſible; and, in this poſition, he ſat, until two ſurgeons came to his aſſiſtance. They applied compreſſes, over which was a bended board on the upper part of the foot, and fore part of the leg, which they kept, as near as they could, in a ſtraight line, by a tight bandage with a long roller. But, as this mode of dreſſing ſoon became very uneaſy, it was changed for the following: A foot-ſock or ſlipper was made of double quilted ticking, from the heel of which projected a belt or ſtrap, of length ſufficient to come up above the calf of the leg. A ſtrong piece of the ſame materials was prepared, of breadth ſufficient to ſurround the calf, and to be faſtened with laces. On the back part of this was a buckle, through which, when the ſtrap of the foot-ſock was paſſed, the foot could be extended, and the calf brought down at pleaſure, as will be eaſily underſtood by the figure (Pl. 1. Fig. 2. Phyſical and Literary Eſſays, Vol. 1. Tab. 8. Fig. 5). The leg and foot were wrapped up in ſoft flannel, fumigated with benzoin, and the bandage kept on

day and night; the belt being made tighter while he was going to ſleep, and ſlacker when he was awake, and perfectly on his guard. For a fortnight, he made no motion whatever with his foot or leg, but was carried on a chair with caſtors, from one part of the room to another. After this, he began to move the joint of the foot, but in ſuch a gentle manner as not to give any pain; and gradually increaſed the motion as the tendon could bear it, taking care to ſtop when the motion began to give uneaſineſs; and continuing this exerciſe with the ſore for half an hour at a time, but keeping the other as much at reſt as he could. In a few days, the hollow between the divided ends of the tendon became imperceptible, though the part continued ſoft for a conſiderable time longer. By degrees, this part became thicker and harder, until at laſt a knot was formed in it, ſeemingly of a cartilaginous nature; but this, though at firſt of the ſize of a middling plumb, gradually became much ſofter and ſmaller, though it did not entirely diſappear. Having occaſion to go abroad in ſix weeks from the accident, he put on a pair of ſhoes, with heels two inches high, and contrived a machine of ſteel to keep his foot in the proper poſition; but this ſteel machine he afterwards exchanged for another of the ſame materials with the former; and it was not until five months after

after the injury that he thought proper to lay aſide every aſſiſtance, and put the ſtrength of the tendon to a trial.

When tendons happen to be cut through by any ſharp inſtrument, it has been uſual to unite the divided ends by future; but the inflammation which takes place very often burſts aſunder the ſtitches, and thus renders matters worſe than they were. It is much better ſimply to unite the divided ends of the tendon, and keep them in this poſition, as was done in Dr Monro's caſe, and which will ſufficiently explain the method of treating accidents of this kind.

## SECTION VII.

### *WOUNDS IN THE LIGAMENTS.*

In this ſection, I mean only to conſider thoſe of the ligaments which inveſt the large joints, ſuch as the knee, ancle, ſhoulder, wriſt, and elbow, commonly called capſular ligaments. Theſe have in general been conſidered as deſtitute of all ſenſation. But, though they do not in a ſound ſtate, or, when firſt they receive an injury, diſcover great ſigns of ſenſibility; yet, when once an inflammation takes place, the pain occaſioned by

by it is exceſſive; and we find, that ſuch wounds require much more attention than we would at firſt be apt to ſuppoſe. Some ſlight caſes, it is true, have eaſily healed, where a wound has penetrated the ligament, and the cavity of the joint has been laid open; but, in far the greater number of wounds of this kind, the utmoſt danger is to be dreaded, and the ſurgeon ought at all times to be upon his guard, as ſometimes the bad ſymptoms do not come on for ſeveral days after the injury is received. The time of their coming on, indeed, is various, principally according to the nature of the wound, by which the cavity of the joint is more or leſs laid open, and the air admitted to it. The firſt ſymptoms uſually are a ſtiffneſs in the joint, increaſing gradually, and attended with a deep-ſeated and dull pain; after which, the joint becomes ſwelled, tenſe, very painful, and ſomewhat inflamed; by reaſon of all which the patient refuſes to attempt moving it. All the bad ſymptoms continue daily to increaſe, until the ſwelling and inflammation round the joint becomes very conſiderable, inſomuch that the patient at laſt can ſcarce bear it to be handled in the moſt gentle manner, and will not allow the leaſt attempt to be made to move it. All wounds of the cavity of a joint are attended with an efflux of the ſynovia; but, as the ſwelling increaſes, and the edges

edges of the wound become thicker, this efflux is gradually ſtopped, and the edges of the wound become ſtiff and dry, and appear ſloughy. This is, in a ſhort time, ſucceeded by large, ſoft, and very painful ſwellings, particularly on the anterior and inferior edges of the patella; which, increaſing by degrees, ſurround the whole of the lateral and interior part of the joints. Theſe, when they either burſt naturally, or are laid open artificially, pour forth a conſiderable quantity of matter, compoſed of pus, ſynovia, and the liquid contained in the burſæ mucoſæ. Some relief is uſually obtained by the evacuation of this matter; but this is only of ſhort duration; for new ſuppurations conſtantly take place, the bones become corroded, the patient is ſeized with an hectic, and death, ſooner or later, enſues.

Thus all wounds in the ligaments commonly end, particularly where the cavity of the joint has been laid open, and the cure left to nature. From attending to the nature of the ſymptoms, from the very beginning, we will ſee that the cure depends entirely upon excluding the air, if poſſible, from the cavity of the joint; for it is, in an eſpecial manner, by this acceſs that the bad ſymptoms are produced; and, if theſe cannot be prevented in any other way, it muſt be done by amputating the limb entirely. It is indeed of

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no leſs pernicious conſequence to admit air into the cavity of a large joint, than into thoſe of the thorax or abdomen, and death will as certainly be the conſequence of the one as of the other. Hence it is evident, that the care of the ſurgeon muſt be conſtantly directed to prevent the acceſs of the external atmoſphere into the cavity of the joint, and to produce a cicatrix as quickly as poſſible. Where the ligaments are greatly lacerated, this is generally impracticable; though it may be done where the opening is but ſmall; for, in theſe caſes, we may generally, by placing the limb in a proper poſture, and drawing the ſkin over the wound in the ligament, exclude the air entirely. This ought always to be done in ſuch a manner as not to allow the ſkin to retract in the leaſt; and for this purpoſe we may properly apply adheſive plaſters. Having then put the patient to bed, and laid him in the moſt convenient poſture, in which he muſt continue for ſeveral days, we muſt endeavour, by means of adheſive ſtraps, to pull the ſkin over the wound in the ligament, in ſuch a way as to ſhut out the air completely; and in this way it ought to be kept ſhut conſtantly until the wound in the ligament be filled up. But, if we find it too difficult to retain the parts in contact, by means of adheſive ſtraps, we muſt then have recourſe to the interrupted future; the method of doing

which has been already treated of. The ſkin ſhould then be kept in its place by a roller, either of linen or flannel; and the leg placed in ſuch a ſituation as to allow the ſkin to be relaxed as much as poſſible. When the wound is on the anterior part of the joint, this is done by ſtretching out the leg; but, when the wound penetrates through the ham, the ſkin is relaxed by bending the knee.

In this way we muſt treat wounds in the ſkin, and teguments of the knee joint, after the extraction of the ſmall bony ſubſtances that form in the joints of the knee, and are called *ſeſamoid* bones. The method of performing this operation is as follows: The leg muſt be completely ſtretched out, and the ſkin of the knee drawn up by an aſſiſtant as much as poſſible. The ſurgeon is then to ſecure the bone, by preſſing upon each ſide of it with the fore and middle fingers of his left-hand, and, with a ſcalpel, makes a tranſverſe inciſion, through the whole extent of it, in the teguments and capſular ligament. The wound is to be no longer than juſt to allow the ſmall bone to be taken out with a hook; and the air is to be excluded as completely as poſſible, by preſſing down the ſkin cloſe to the bone as we remove it, and, immediately after the removal, preſſing it down again upon the wound in the capſular ligament, upon which

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it acts as a valve; and, after this, the moſt effectual mode of preventing the air from having acceſs again, is by uſing the interrupted future; after which the limb muſt be laid quiet, and the inflammation prevented, by uſing the antiphlogiſtic regimen. Blood-letting ought to be uſed freely, his bowels ought to be kept lax, and a gentle moiſture kept upon his ſkin by a diaphoretic mixture; of which the beſt kind is one compoſed of ſp. Minderer. &c.

Where the mode of treatment juſt now recommended, has been too long neglected, ſo that cloſing up the wound would be productive of no good effect, we muſt endeavour, by every poſſible method, to remove the inflammation which has already taken place, uſing every effort at the ſame time to prevent the admiſſion of more air, by covering up the wound, with pledgits ſpread with ſome kind of mild emollient ointment. The beſt method of allaying inflammation in the large joints, is, by topical blood-letting, with leaches, cupping and ſcarifying, bliſtering, and fomenting the part with aſtringent lotions. Blood-letting is here eſpecially of uſe; and the more blood is taken away, and the quicker it is done, the greater is the chance of the inflammation being removed. The reaſon why the inflammatory ſymptoms riſe to ſuch an height, in caſes of wounded joints, is, that the

colourleſs veſſels about the joint, become filled with blood, which proves a violent ſtimulus, as well as the air admitted into the cavity. It is, therefore, of the greateſt conſequence, to take blood freely from the part; this ought always to be done in the firſt place, after which we may uſe with ſucceſs the ſteam of warm vinegar. The beſt method of applying this, is by means of a wooden box, exactly fitting the limb, from the middle of the thigh to the middle of the leg, when the leg is ſtretched out upon the bed, and ſo cloſe, that little or no air can get out betwixt the limb and the edges of the box; the under ſide of it being contiguous to the bed. The vinegar is placed at the patient's bedſide, in a large pan put over a choffer. The ſteam is conveyed into the inſide of the box, by means of a hole in one of the ſides through which a tinned iron funnel paſſes from the pan directly oppoſite to the knee joint which it ſurrounds; and its eſcape is prevented, by covering the box with a blanket, beſides the precautions already mentioned. The fomentation ſhould be continued twice or thrice every day, half an hour at a time. As long as the pain continues violent, the patient ſhould have a large doſe of an opiate twice a day; and, by perſevering for ſome time in the uſe of theſe remedies, the patient will often be greatly relieved, or, even completely

cured, where the injury is not very great, and where the ſurgeon has been called in proper time. But, in caſes where the laceration of the ligament has been very great, the inflammation will at laſt probably terminate in ſuppuration, whatever pains we take to prevent it. The conſequence of this is what we have already mentioned, viz. deſtruction of the ligaments, corroſion of the ends of the bones; after which, little or no hope of ſaving the limb remains; for, whatever care we take to evacuate the matter, new abſceſſes ſtill break out, and the patient is deſtroyed, unleſs the limb be taken off. There is not, indeed, any well authenticated caſe, where the cavity of a joint has been fully penetrated by matter, that the patient has ever recovered, even ſo far as to have an anchyloſis; and this, whether the ligaments have been lacerated, or whether they have been laid open by inciſion. The reaſon of all this is obvious. If the matter penetrates through the whole cavity of the joint, it is impoſſible to exclude the air alſo; and this will produce ſuch an affection of the whole body of it, as will greatly aggravate all the alarming ſymptoms already mentioned.

In leſſer injuries of the joints, we commonly prove ſucceſsful, by excluding the air as completely as poſſible from the firſt, and doing every thing in our power to abate the inflammatory ſympto ms

ſymptoms from running to a great height. In theſe caſes, the limb may be ſaved; and, indeed, in all caſes where ſmall bones or hardened cartilages are cut out, the wound may be ſo completely ſhut up that no air can enter it, and thus a cure may be effected, without any danger of ſtiffneſs in the joint; and, in three caſes of this kind, I have ſucceeded perfectly well, the patient being able to walk in twenty-four days from the time he received the injury. But, where the joints have been penetrated by large wounds, and theſe have nearly terminated in ſuppuration, alſo, where the capſular ligament and ends of the bones have been much injured, I would conſtantly adviſe amputation to be performed inſtantly.

I am well aware, that ſurgeons of great eminence in their profeſſion have mentioned, that patients, in their full health and vigour of body, recover much more ſeldom from injuries of this kind, than ſuch as have been conſiderably waſted by ſuppuration, and other ſevere ſymptoms. But, if proper attention be paid for the firſt four or five days, I heſitate not to affirm, that a healthy and ſtrong patient will recover much more quickly than one that has ſuffered much from the debility induced by too great ſuppuration or otherwiſe. The only and great danger ariſes from the high degree of inflammation which takes place immediately after the operation,

operation. But this, by judicious management, may always be kept under; and an experienced and ſkilful ſurgeon will not fail to uſe the means proper for the purpoſe, viz. the lancet, keeping the patient cool, and expoſing the end of the ſtump as much as poſſible to the air, by leeches, and by keeping it moiſt with clothes dipped in a ſolution of lead, after the bleeding with the leeches has been puſhed far enough, ſo as to relieve the pain.

## SECTION VIII.

### *WOUNDS IN THE FACE.*

We have already fully treated of wounds in the head and face, by which the bones were affected; and, to what has been already ſaid upon that head, we muſt refer our readers. To what is there ſaid, it is here neceſſary to add, that, in every wound of the face, it is of great importance to make the cicatrix as ſmall as poſſible. This, indeed, ought to be a particular conſideration in curing wounds, wherever they may be ſituated; but more ſo in the face than any where elſe, on account of the deformity they occaſion, if the cicatrix be large. This can only be done by bringing the ſides of the wound into contact as completely as poſſible; and, in all caſes where the wound is ſituated directly on the face, we ought

ought invariably to uſe the gold pins, or twiſted ſuture, by which the edges will be kept cloſe together without any retraction; but, as the method of doing this has been already fully treated of and explained, we need ſay no more about it here; ſo that I muſt refer the reader to what has been ſaid under the heads of twiſted ſutures and harelip.

Wounds of the forehead, ſeated juſt above the eye-brows, are ſometimes attended with pretty copious hæmorrhage from a ſmall artery which runs in a groove, or through a notch in the ſuperciliary proceſs of the orbit to the forehead. The danger ariſing from this hæmorrhage has been greatly magnified by ſome writers on ſurgery, inſomuch that they have told us not only of uſing the needle, but of removing part of *one*, or perhaps both tables of the ſcull. This laſt, however, can never be uſeful, nor even the needle itſelf; becauſe, though the artery does indeed paſs through an hole in the bone, this is by no means equivalent to paſſing through a long groove between the tables of the ſcull, as theſe writers have aſſerted. On the contrary, we may, without heſitation, affirm, that, wherever this hæmorrhage occurs, the blood may always be ſtopped, by applying a little of the fine powder of agaric, and keeping it for ſome time upon the place. In wounds of the cheek, where the ſali-

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vary ducts are injured, the same methods must be followed as have been directed in the second volume of this work; and, where these directions are punctually obeyed, I may venture to say that the patient will, almost always, be cured without any difficulty.

## SECTION IX.

### *WOUNDS OF THE TRACHEA AND OESOPHAGUS.*

The trachea is most commonly wounded transversely, and generally between two of the cartilages; and, for the most part, it is only the anterior part of the tube that is wounded. Where this is but small, it may generally be cured by means of a bit of adhesive plaster, particularly when the head is kept in a proper position. But, where the wound is of such extent as to divide the whole anterior part, it will be proper to bring the edges together, by means of the interrupted suture. In this case, we ought to make use of broad flat ligatures, and a flat crooked needle at each end of the thread. These must be passed through the skin and cellular substance, upon the outside of the cartilaginous tube of the trachea, at least an inch above, and as much below

low the wound; and three or four of theſe ſtitches will generally be ſufficient for any injury in this part. Some practitioners have been in the uſe of putting the ſtitches through the trachea itſelf; but this is very injudicious, on account of the irritation they occaſion. In this caſe, a violent cough always takes place, and the ſtitches are again torn open; they ought therefore never to go deeper than the cellular ſubſtance. After they are introduced, the edges of the wound muſt be brought together, and kept in that ſituation by an aſſiſtant, until the ſurgeon ties the ligatures with a ſlip-knot, that we may have it in our power to ſlack or unlooſe them whenever there is occaſion. Laſtly, an adheſive plaſter is to be applied over all, and the head ſecured in a proper manner, ſo that there may be no danger of tearing open the wound by any ſudden motion of it.

In ſome caſes, however, the method juſt now mentioned will be found not to anſwer; the coheſion of the parts may be too weak to retain the ſtitches, and thus the wound may again fly open. Here, then, another method muſt be employed. A ligature muſt be paſſed round one of the cartilages above, and another below the wound, which may eaſily be done, by having two curved needles upon the ſame flat thread, as before. We muſt enter the point of one from within

within and below the firſt and ſecond cartilages on the under ſide of the wound, puſhing it outwards, and doing the ſame thing with the other needle above. Having then paſſed as many ligatures as may be deemed ſufficient, we muſt again bring the ſides of the wound together, and tie the ligatures as directed. In general, there will be no more neceſſary than three, one on each ſide of the throat, and another exactly in the middle of the anterior part.

I have ſome doubts whether the œſophagus can ever be wounded without deſtroying, at the ſame time, the large blood-veſſels and nerves, ſo that the patient muſt inſtantly die. But, if it ſhould chance to happen otherwiſe, and only ſome ſmall branches of arteries happen to be cut, we muſt take them up, by means of the tenaculum and ligature, in order to ſtop the hæmorrhage, and prevent the blood from getting into the ſtomach, or into the cavity of the thorax, where, by irritating the lungs, it would produce a very troubleſome cough, by which the patient's complaints muſt all be much increaſed. As ſoon as the veſſels are tied up, and the hæmorrhage ſtopped, we muſt bring the ſides of the wound together, and retain them in their place by adheſive ſtraps, which, however, will anſwer beſt in longitudinal wounds of this part.

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In tranſverſe wounds of the œſophagus, we muſt enlarge the external inciſions on both ſides, ſo that we may diſtinctly ſee the wound in the tube, and then, by means of the interrupted future, to bring the ſides together; though, I muſt confeſs, that, from the anatomy of the parts, I have very ſmall hopes of ſucceſs from any ſuch operation. In general, we muſt account all wounds of this part exceedingly dangerous; but, if they can be united in ſuch a manner that the patient's food can be prevented from falling into the cavity of the thorax during the cure, there is no doubt that the parts will unite here, as well as any where elſe throughout the body. During all the time that the patient is confined, his food ought to be of the liquid kind, and moſt eaſy of digeſtion, as milk-gruel, jellies, ſago, ſalop, bread-berry, chicken-broth, &c. Injections of ſtrong broths alſo may be uſed with great advantage; and, indeed, for ſome time, it will be proper to make an attempt to ſubſiſt the patient entirely by nutritive injections, until the danger be paſt of the food ſlipping into the cavity of the thorax, which muſt always be attended with the moſt fatal conſequences.

## SECTION X.

### *WOUNDS IN THE THORAX.*

It is well known to every anatomiſt, that, by reaſon of the ſituation of the diaphragm, the cavity of the thorax is much leſs deep in the fore than the back part, being enlarged, both behind, and on each ſide, from the manner in which it is attached to the ribs, and firſt vertebræ of the loins. Thus we ſee, that any wound paſſing either through the right or left ſide of the upper part of the abdomen, called the hypochondria, muſt, at the ſame time, enter the cavity of the thorax. The whole cavity is lined with a firm membrane, called the pleura, adhering firmly, in every point, to the ſternum, intercoſtal muſcles, ribs, and diaphragm. It is alſo divided into two cavities, by the membrane, called the mediaſtinum, which is firmly attached to the ſternum throughout its whole length, running acroſs the diaphragm, directly through the middle, and firmly attached in its back part to the ſpine. This membrane is formed by a duplicature of the pleura, which, in the back part, is reſolved into its two original laminæ, in order to allow a paſſage

paſſage for the œſophagus and aorta aſcendens. The heart, ſurrounded by the pericardium, occupies a conſiderable part of the anterior and middle part of it, in the left ſide, lying nearly in a tranſverſe direction. The remainder of the left ſide of the thorax is filled with two lobes of the lungs; and the whole right ſide of it is filled with three lobes of the lungs, beſides the large blood-veſſels, thoracic duct, and thymus. In a healthy ſtate of the body, the lungs are entirely detached from the pleura coſtalis; however, in a very high degree of inflammation, ſuch as in pleuriſy and peripneu ony, an adheſion frequently takes place.

Theſe are often not only very firm, but very extenſive. This part of the body is very liable to be wounded; and the wounds which are inflicted upon it are of four different kinds. 1. Thoſe which only divide the ſkin, cellular membrane, but neither penetrate the cavity, nor fracture the ribs or ſternum. 2. Thoſe which, beſides the ſkin, cellular ſubſtance and muſcles, penetrate alſo the pleura, but without any injury to the lungs, or other thoracic viſcera 3. Where not only the cavity is penetrated, but ſome of the viſcera are wounded. 4. Such as penetrating the ſkin, cellular ſubſtance, and muſcles, fracture the ribs or ſternum, and then paſſing through the pleura, injure alſo the viſcera. Of each of theſe we ſhall treat in order.

1. Superficial

1. Superficial wounds of the thorax, which only pierce the integuments, may eaſily be diſtinguiſhed from the others, by tracing the direction of the wound from its entrance to its exit, either by the fingers, or a large bougie, which is preferable to any metalline probe. In theſe, no air can be drawn into the thorax during the time of inſpiration, nor expelled during expiration, ſo as to impede the motion of the lungs, as is the caſe with other wounds where the cavity is penetrated. Theſe wounds are ſeldom attended with any danger, and will always heal as eaſily as in any other part of the body. In ſuch wounds, we ought generally to enlarge the moſt dependent orifice for ſeveral inches, by which means the matter will always have a proper vent; and any extraneous bodies may eaſily be got out, or diſcharged along with the matter. In like manner, when the wound only paſſes through the ſkin and cellular membrane, without paſſing below any of the muſcles, and when the wound is not very extenſive, we ought at once to lay it open from one end to the other, by means of a probe pointed biſtoury and directory, dreſſing it with mild ſoft dreſſings throughout the whole length, until it begin to granulate from the bottom. In the ſame way we are to treat inciſed wounds; and, as ſoon as the granulations are thoroughly formed over the whole

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furface, the ſides of it ought to be brought into contact, and kept ſo, by adheſive ſtraps. But it is obvious, that, when any wound paſſes under the muſcles that cover the thorax, and has an exit at ſome diſtance from the entrance, no inciſion ought to be made, further than to enlarge the moſt dependent opening, to give vent to the matter, or any extraneous bodies that may be lodged in the wound. Many chirurgical writers have recommended the uſe of ſetons in wounds of this kind; but I apprehend that no ſkilful ſurgeon will venture to introduce a ſeton through the body of any muſcle; and, ſhould any one do ſo, he will ſoon be ſenſible of the impropriety of his conduct, by the violent pain, inflammation, and tenſion, which muſt unavoidably enſue. Theſe ſymptoms, indeed, are commonly ſo ſevere, without the uſe of any ſeton, that it requires the utmoſt exertions of the moſt ſkilful ſurgeon to keep them within bounds; and that blood-letting, both general and topical, and the mildeſt dreſſings, muſt be made uſe of for this purpoſe. A ſeton may, indeed, be uſed with ſucceſs in wounds which only penetrate the cellular ſubſtance, and where there is a probability, that, by laying open the whole wound, we would expoſe too great a ſurface to the air. In caſes of this kind, we may conveniently diminiſh the ſize of the cord every day, as ſoon as a full and free

free ſuppuration has taken place, as has already been directed; and thus the wound will be cicatrized in a very ſhort time, with eaſe to the patient, and credit to the ſurgeon. But, where the muſcles are wounded, we muſt apply warm poultices, emollients, &c. in order to procure a free and plentiful ſuppuration. After this has continued for ſome time, and the pain diminiſhes, together with the inflammation and tenſion, and every extraneous body is certainly removed, we muſt dreſs both openings regularly with mild applications, putting above them a neat linen compreſs, of ſufficient length to cover the whole ſinus, and of the breadth of ſeveral inches, ſecuring the whole with a roller, four inches broad, put round the thorax pretty firmly; only not to affect the motion of the ribs, or cauſe any impediment in the patient's breathing. The roller muſt be ſupported, by a ſcapulary put over the ſhoulders, and pinned to it both before and behind.

Thus, we may certainly cure every ſinous ulcer which does not run very deep, where the patient is healthy, and the matter of a good conſiſtence, and where every ſymptom of inflammation has ſubſided, and the matter been diminiſhed in quantity. Where theſe circumſtances concur, we will have the ſatisfaction, in a very few days, of ſeeing the wound completely healed,

without any occaſion either for tents or ſetons. But, if the inflammatory ſymptoms ſhould run high, we muſt endeavour to allay them by blood-letting, general and topical, according to the ſtrength of the patient; and the regimen, both with reſpect to food and drink, muſt be of the antiphlogiſtic kind. Fruits and vegetables of all kinds may be given freely, and the bowels kept moderately open by ſome gentle laxative; but all animal food, as well as heating liquors, muſt be ſtrictly prohibited. Motion of every kind muſt be avoided, either from ſpeaking, coughing, &c. or from exerciſe. If a tickling cough comes on, it muſt be allayed by means of opiates.

2. Where the cavity of the thorax is penetrated, but without any wound of the viſcera. Theſe wounds, though much more dangerous than the former, are leſs ſo than others where the viſcera are likewiſe injured. They, however, require great care and attention on the part of the ſurgeon, during the courſe of their cure. But, before we proceed farther, it may be proper to remark that the cavity of the thorax is always entirely full, whether the perſon inſpires or expires; nay, even after death, they continue to fill the cavity as completely as before. But, when any ſmall wounds are made between the ribs, ſo as to penetrate the intercoſtal

coſtal muſcles and pleura, by which means the air is admitted to the cavity of the thorax, then the lungs immediately collapſe on that ſide where the wound is, and the ſpace between them and the pleura is filled with atmoſpheric air; but, in ſuch caſes, it is evident that the wound can be but of ſmall extent; for, if it pierces deep, it will injure ſome of the viſcera; and, if it extend to any diſtance, either upward or downward, one of the ribs muſt of courſe be broken. The only way in which a wound of this kind can be inflicted, is by a ſmall ſword, or other pointed weapon; or poſſibly, by a very ſmall piſtol bullet paſſing between the ribs, and ſtopping juſt when it has penetrated the cavity of the thorax. It may be known to have done ſo, by the ruſhing in of air by the wound during the time of inſpiration; or, if the wound is large, it may be examined by the fingers, which, previous to this, ought always to be dipped in fine oil; a precaution ſo obvious, that I am ſurpriſed it has never been practiſed, nor even recommended by any chirurgical writers. A ſurgeon's fingers are not always clean; and, even though they were ever ſo clean, the perſpiration, with which every part of the human body is always in ſome meaſure moiſtened, has ſomething of a ſaline nature, and cannot fail to irritate any freſh wound. But all

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the bad conſequences ariſing either from a ſmall degree of uncleanneſs, or from perſpiration, may be prevented by means of oil, which will alſo be the means of promoting the paſſage of the finger into the wound more eaſily than if it were dry. Should, then, the wound be of ſufficient magnitude, we muſt examine it, by introducing the finger dipped in oil, into the external orifice, and thence, through the whole extent of the wound into the cavity of the thorax. But, if the wound be too ſmall to allow of ſuch examination, we muſt employ a bougie well oiled for the purpoſe; for mettalline probes ought never to be introduced into freſh wounds, eſpecially ſuch as penetrate the cavity of the thorax or abdomen. They ſhould never, indeed, be made uſe of in any caſe but with the utmoſt caution; and only where we expect to meet with carious bones, or with ſome hard and foreign ſubſtances, by which the wounds are kept open.

3. In wounds that not only penetrate the cavity of the thorax, but injure the lungs, we know the extent of the injury, by the quantity of air which ruſhes out through the wound during inſpiration, and enters the cavity of the thorax in the time of expiration. A conſiderable quantity of blood, generally mixed with much air, flows out of the wound, and a quantity of

blood of the ſame kind is expectorated by coughing; a great difficulty of breathing, and ſometimes emphyſema, being the concomitants of the other ſymptoms. Theſe wounds are always attended with great danger. 1. On account of the loſs of blood, which flows out in great quantity, as the whole blood of the body paſſes through the lungs. 2. From the number and ſize of the veſſels wounded; and the deeper the wound, the greater is the danger; and very often, indeed for the moſt part, ſuch injuries terminate fatally; and in all caſes where the patient is of a diſeaſed habit, or in the leaſt intemperate, we may venture to ſay that he will certainly die.

In wounds of the lungs it is common for the patient inſtantly to ſink under the loſs of blood, and expire in a few minutes after the wound is received; or, if he does not, his ſtrength is, for the moſt part, exhauſted by the formation of abſceſſes in different parts of the breaſt. Theſe bring on hectic fever, copious ſweats in the night-time; particularly about the head, breaſt, and arms. A copious purulent diarrhœa likewiſe comes on, attended with twiſtings about the navel before each evacuation; and after theſe ſymptoms have continued for ſome time, the urine will be alſo found to depoſit a large quantity of pus, by all which the unhappy patient is at laſt deſtroyed. But,

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in people of good habit, and who live temperately, there are inſtances of wounds in the breaſt having been cured, where the cavity of the thorax has been quite penetrated from one ſide to the other; though there has not been any difference in their treatment from thoſe already mentioned.

In wounds of this kind, the only artery we can ſecure, is the intercoſtal one, which alſo may be injured by a ſimple fracture of the ribs, though the lungs be not wounded; and, on the other hand, may not be wounded, though the ſubſtance of the lungs be injured. This artery is but ſmall, and it is ſometimes very difficult to ſtop the bleeding of it, on account of its running for ſome way in a ſmall groove in the bone. In order to ſtop the hæmorrhage, we muſt make a free external inciſion, by means of which we will have acceſs to the wounded veſſel; and, if the rib happens to be broken, we may thus alſo be enabled to remove any of the ſplinters. After the wounded part of the bleeding veſſel is brought into view, we muſt pull it out, by means of the tenaculum, endeavouring to puſh the point of the inſtrument between the rib and artery, piercing at laſt both ſides of the veſſel with it, which will enable us to ſeparate it from the bone, and tie it up in the uſual manner. Inſtead of uſing the tenaculum, however, we may ſtop the bleeding,

bleeding, with the fine powder of agaric; and, having afterwards removed every extraneous body, and evacuated, as far as poſſible, the blood which has flowed into the cavity of the thorax, we muſt cover up, not only the wounded part of the artery with ſmall doſſils of caddice; but the ſides of the wound muſt be brought together, and covered with a plaſter ſpread with the mildeſt kind of ointment, ſo completely, that no air can have acceſs to the cavity of the thorax; in order to prevent the difficulty of breathing, and anxiety that always takes place, in caſes of this kind, the patient muſt be deſired to make an heavy and full inſpiration; and, as ſoon as this is done, the ſkin muſt be brought over the wound, ſo as to cover it completely, if poſſible, during the time of expiration; and, by repeated trials of this kind, the air will at laſt be totally expelled from the cavity of the thorax. After this, the wound muſt be exactly cloſed, by bringing the lips of it into contact, as cloſe as poſſible, and ſecuring them in that poſition, by ſlips of adheſive plaſter. The whole muſt afterwards be ſupported by a broad bandage of linen, put ſeveral times round the body, and retained in their places by a ſcapulary. Every degree of attention muſt be paid to prevent the admiſſion of air, the formation of matter, the lodgment of blood, ſerum, &c. which very frequently take place in wounds

wounds of the thorax; for theſe never fail to produce anxiety, difficult breathing, and other alarming and dangerous ſymptoms. That this may be accompliſhed, the patient ought to be laid on a bed, in ſuch a poſture, that the wound may be the moſt dependent part of the cheſt; and in order to do this, we muſt elevate the under part of the body, when the wound is in the upper part of the cheſt, or near the middle, and depreſs it when the lower part is wounded; and thus, we may eaſily avoid any collection of extravaſated blood in the cavity of the thorax; and, if the ſurgeon be careful, at every dreſſing, to evacuate any quantity of matter that may be collected, and to prevent the admiſſion of air into the thorax, there will never be any occaſion for making another opening than that of the wound itſelf. Openings in this part of the body, indeed, even though made with the utmoſt caution, are always attended with great danger; being nothing elſe than making new wounds, each of which may be productive of all the bad conſequences of the others; and, therefore, every ſurgeon ought to uſe every endeavour to evacuate the blood, or matter, by putting the body in a convenient poſture, for allowing the extravaſated fluids to run out at the wound.

During the cure of this kind of wounds, it is evident that the patient ought to be kept very quiet,

quiet, and the inflammatory ſymptoms kept down by plentiful blood-letting, a cooling diet, and antiphlogiſtic regimen. His drink ought not only to be of the cooling kind, but alſo mucilaginous, and his belly ought to be kept regularly open by mild purgatives. The cough and reſtleſſneſs muſt be appeaſed by opiates; and, thus, if the injury has been not ſo great, that the vital powers cannot repair it, the patient will at laſt get free from all his complaints, and the wound will heal up; but we muſt never allow it to heal, until every particle of extravaſated blood or other extraneous matter be evacuated.

3. Where the lungs themſelves are injured, the diſcharge of blood, both by the mouth, and the orifice of the wound, will not ceaſe on the tying up, or otherwiſe ſtopping the flux from the intercoſtal artery; for, as all the blood of the body paſſes through the lungs, it is evident, that, even the ſmalleſt veſſels of that part, when ruptured, muſt bleed very impetuouſly; and, if many of them are deſtroyed at once, the patient muſt inevitably die. The only way in which the diſcharge from the lungs can be mitigated, is by copious blood-letting frequently repeated, and by keeping the patient as cool as poſſible. If it is the ſummer ſeaſon, all the windows of his apartment muſt be kept open; his food ought to be of the lighteſt and moſt cooling

ing kind; and, if it is the ſeaſon of ripe fruits, he ought to uſe them freely. In other ſeaſons of the year, he muſt live moſtly upon boiled or baked fruits, but ought never to taſte of the paſte, in which they are baked; and, it is almoſt unneceſſary to mention, that the ſtricteſt attention muſt be paid to quietneſs on the part of the patient, and that any diſturbance, either of body or mind, muſt be carefully avoided. Coughing muſt be avoided, and ſuch medicines exhibited, as are calculated to prevent it. The moſt proper for this purpoſe are thoſe compoſed of opium, joined with ſome mucilage of gum arabic, or any other ſoftening pectoral. He muſt not be allowed to ſpeak; and every method muſt be uſed to place the patient ſo that the wound may be the moſt dependent part of the body; and thus any collection of matter or blood, that may be formed between the pleura and lungs, or in the lungs themſelves when wounded, will generally be evacuated through the wound.

As wounds of this kind are always extremely dangerous, it is plain that the utmoſt caution muſt be uſed in dreſſing them. At every time the dreſſings are taken off, we muſt uſe all our endeavours to evacuate any blood that may have collected during the interval; and, as it muſt always be uncertain whether a large or ſmall quantity

quantity has been collected in any given time, it is alſo evident that no rule can be laid down for the frequency of the times of dreſſing. The only way by which we can regulate our conduct in this matter, is by the quantity of matter diſcharged at each time, and the relief that is thereby given; and therefore, when the breathing again becomes very difficult, and the patient greatly diſtreſſed, we muſt again give relief by dreſſing the wound, and evacuating the matter. By carefully attending to this, as well as to every other thing which may occur in wounds of this kind, the diſcharge, in an healthy, young ſubject, will ſoon begin to diminiſh, the wound in the ſubſtance of the lungs will alſo begin to heal, and will at laſt cicatriſe. In general, however, in all wounds of the lungs, ſlight adheſions take place betwixt them and the pleura; particularly if due care has been taken to evacuate the matter as faſt as it was collected; and by means of this adheſion we may eaſily obſerve whether the wound in the lungs heals up properly or not. When we find that the internal wound is completely healed, we ought next to promote the cure of the external one, by drawing it together as much as we can; and, unleſs in very extraordinary caſes, we need not doubt of its healing up in a ſhort time.

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We have already, (under the head of paracenteſis of the thorax), fully treated of the beſt methods of evacuating any collections of blood or matter which may take place in the cavity of the cheſt from internal cauſes, and we ſhall now conſider the proper mode of treatment to be obſerved in thoſe abſceſſes of the lungs called by phyſicians vomicæ. Theſe are collections of matter formed in the ſubſtance of the lungs themſelves, but without any opening, either external or internal, ſo that the matter can neither be diſcharged by the mouth, nor through any external opening of the integuments, nor even into the cavity of the thorax, till they become at times very large. The firſt ſymptoms of a vomica are coldneſs and ſhivering, attended with great debility, particularly in the lower extremities. A ſlight cough comes on, attended with ſome pain in one of the ſides of the thorax. This pain, in general, is at firſt confined to a particular ſpot, ſo well defined, that the patient can point it out with his finger. The coldneſs and ſhivering are by degrees ſucceeded by heat, reſtleſſneſs, a troubleſome cough, attended with conſiderable pain on every inſpiration. During this ſtage of the diſeaſe, we muſt attempt the patient's relief by general blood-letting; and, if this does not anſwer the purpoſe, recourſe muſt be had to cupping with ſcarification. We ought alſo to apply bliſters frequently; and endeavour, by ſoft

pectorals, in which the tinctur. thebaic. forms a conſiderable part of the compoſition, to allay the cough. The following is the beſt mixture of this kind I am acquainted with.

℞ Mucilag. g. Arab. ℥ iv.
Aq. cinnamom. ſimp. ℥ iſs.
Suc. limon. ʒ iij.
Syr. commun. ℥ v.
Aq. fontan. ℥ iſs.
Laud. liquid. gtt LXXX. *M.*

A table ſpoonful of this mixture is to be ſlowly ſwallowed at any time when the cough is troubleſome, and will generally give relief.

In this diſeaſe the pulſe is always very quick; ſeldom leſs than 120 in a minute; and, if the other ſymptoms increaſe, particularly the teazing cough, attended with the fixed pain in that particular part of the cheſt, we are certain either that the patient is in a confirmed phthiſis, or that a vomica is forming. The ſign of a confirmed phthiſis is, when the pain is more largely diffuſed over the cavity of the cheſt, and the cough moſt ſevere in the night, about two o'clock in the morning, whilſt, at the ſame time, the expectoration falls to the bottom of the baſon with water, and it differs from the vomica in this, that the matter is not collected into one bag, but diſperſed in ſeveral ſmall abſceſſes like ſuppurated glands; and which indeed I really believe they are, from comparing them with the

the glands of the meſentery when ſcrophulous, and in a ſtate of ſuppuration, no difference can be obſerved between them. The vomica, on the other hand, is only an abſceſs in the lungs, confined to a particular ſpot, marked by conſtant fixed pain, as already mentioned, ſimilar to thoſe in other parts of the body, and generally ariſing from the ſame cauſes.

If, from fortunate circumſtances, the vomica breaks into the bronchiæ, a vaſt quantity of matter is evacuated by the mouth, not without danger of ſuffocation to the patient; but, if he eſcapes this firſt danger, all the matter in the abſceſs will by degrees be ſpit up, and the ſore will heal, as in other parts of the body. During all the time that this is going on, however, the patient muſt be kept extremely quiet; he muſt not be allowed to ſpeak, and his food muſt be light, and eaſy of digeſtion; the cough muſt be kept under by anodynes, and the room ought to be rather cool than otherwiſe. As ſoon as his ſtrength will permit, he ought to take ſome exerciſe in a chaiſe; and when his expectoration is conſiderably diminiſhed, as well as his ſtrength increaſed, he may then remove to ſome part of the country, where the air is ſalubrious and temperate, until the cure is completed.

In this way I have ſucceſsfully treated five people, each of whom had a large vomica, as appeared by the quantity of matter they ſpit up; and,

and, in four months from the firſt evacuation, they were perfectly cured, and have continued to enjoy an uninterrupted ſtate of health ever ſince. But, in ſome others, which have fallen under my care, the termination was leſs favourable. Three of thoſe were ſuffocated by the immenſe quantity of matter contained in the vomica, and expired inſtantly on its burſting. In another, I performed the operation for empyema, and thus ſaved the patient; and from the obſervations I have made upon theſe four, during the time that the abſceſs was forming, I think we might form ſuch a prognoſis as would enable us to avoid the danger of ſuffocation, by allowing them to burſt of themſelves, and ſave the patient. The three who expired inſtantly upon the burſting of the ſiſt, had laboured under ſymptoms of a vomica for more than ſix months, in ſpite of every endeavour to allay them. After the ſymptoms of a complete formation of matter had taken place, it appeared evident to me, that, for a long time, the abſceſs continued to increaſe before it burſt. This was indicated by the following ſigns. 1. By the ceſſation of the acute pain in the ſide. 2. The regular return of ſhivering fits, twice in twenty-four hours. 3. The increaſe and ſpreading of the dull pain. 4. The cough becoming more and more troubleſome on the ſmalleſt motion; and, 5. From an uncommon degree of oppreſſion in the ſide where

where the pain was ſeated, and which conſtantly increaſed as the abſceſs ſeemed to increaſe. At laſt the lobes of the lungs, in which the abſceſs was, ſeemed to be almoſt entirely conſumed and formed into purulent matter.

In theſe three patients, it was remarkable, that all of them were able not only to ſit up, but even to walk about their rooms, till juſt before the fatal moment, when the abſceſs burſt. Their complaints, during the whole time, were tolerable, except when attacked by ſevere fits of coughing. One of them, a ſeal engraver, and a man of great perſonal ſtrength, followed his buſineſs, though frequently adviſed to the contrary, till the very moment of his death. All of them were generally affected with a ſevere fit of coughing in the morning, upon ſitting up in bed, and in one of theſe this gentleman expired. For three weeks before his death, he, as well as the others, had been ſo weak, that he could not walk more than twice acroſs his room at a time; but, notwithſtanding this, as his buſineſs kept him conſtantly in a ſitting poſture, he continued to work till he died, as has been already obſerved. On opening his body after death, a large abſceſs was found, which had burſt into the bronchiæ, and diſcharged ſuch a quantity of matter as to fill the trachea completely. It occupied moſt of the left lobe of the lungs, particularly the under and back part of it. He had often diſtinctly marked

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on the outſide the place where the pain was moſt ſevere; and here I found the abſceſs very thin, and only covered by the pleura, which indeed was a little thicker than ordinary. All around this, both above and below, the matter ſeemed to have waſted the ſubſtance of the lobe, until at laſt it had penetrated deep enough to erode ſome of the large branches of the bronchiæ, and thus diſcharged itſelf, at once in ſuch a quantity, as to fill the trachea, and ſuffocate the patient. The place he had pointed out during his life time, as the ſeat of the pain, and where I afterwards found the abſceſs thinneſt, was about two inches nearer the ſpine than the left breaſt, directly in the ſpace between the latiſſimus dorſi and the pectoral muſcle; and here it is evident that the abſceſs might have been ſafely opened, ſo as to diſcharge the matter externally. In one of the other caſes, the abſceſs occupied the lower part of the undermoſt lobe, on the left ſide, and the pain had its ſeat rather forward, and about two inches below the part where the point of the heart is felt to ſtrike on the ſide. The abſceſs was alſo very large and thin towards the ribs; but had likewiſe penetrated ſo deep into the ſubſtance of the lobe, as to erode the bronchial veſſels, and thus, by the quantity of the diſcharge, to ſuffocate the patient in an inſtant.

In the third patient, the abſceſs was ſeated in the middle lobe of the right ſide, and the pain

was

was ſeated about the middle of the thorax, at about an equal diſtance from the ſternum and ſpine. The abſceſs, in this caſe, was alſo very large, and had deſtroyed a conſiderable part of the lobe; the pleura being ſtill almoſt the only part that kept the matter from flowing out into the cavity of the thorax. In none of the three caſes did the pleura adhere to that part of it which lines the ribs; but, from the extreme thinneſs of that part of the abſceſs which lay next the ribs, it was evident, that, had an opening been made in the centre of the place where the pain was felt, and a trocar been puſhed into the ſubſtance of the lungs, we could not have failed to evacuate the matter to the relief of the patient, for a time at leaſt, by ſecuring the canula in its place, fitting it with a cork, and carefully preventing the admiſſion of air into the cavity of the thorax, while, at the ſame time, we allowed a free vent to the matter, we had alſo a great chance of effecting a radical cure; but, though in theſe three caſes I uſed every argument I could think of with my patients to allow me to give them this laſt and only chance for their lives, I could not prevail upon them to ſubmit to it.

The fourth caſe, where the patient recovered, was not attended with more favourable ſymptoms than in thoſe who died. For ſix months he had laboured under ſymptoms of a vomica

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in the inferior lobe of the lungs on the right ſide; and, having had the good fortune to perſuade him of the danger he was in, and of the neceſſity of performing an operation for evacuating the matter, he cheerfully agreed to ſubmit to it. He was then laid upon a table on his back, with the right ſide turned towards a clear light; an hair matreſs being put under him that he might lie the more eaſily. That the proper place in which to make the perforation might be diſcovered, his right ſide was a little raiſed, and ſupported by pillows, one below the ſhoulder, and another below the haunch. Having ſecured him in this poſition, I made an inciſion between the two firſt falſe ribs, nearly at an equal diſtance from the ſpine and enſiform cartilage, about two inches in length. Having divided the ſkin and cellular ſubſtance at one ſtroke of the ſcalpel, I continued the inciſion through the ſerratus muſcle alſo for about the ſame ſpace; after which, I cautiouſly divided the intercoſtal muſcle, continuing the inciſion down to the pleura. Feeling this membrane very tenſe, and being unwilling to admit air into the cavity of the thorax, I did not perforate the pleura with a lancet, but introduced the trocar, repreſented Pl. 1. Fig. 3. of a flat ſhape, and deeply grooved, ſo as to allow the matter to paſs alongſt it as ſoon as I ſhould penetrate the abſceſs. Having puſhed the

the inſtrument a little more than half an inch through the pleura, the matter began to flow freely through the groove; on which, withdrawing the ſtilette, I puſhed the canula about an inch farther, without any pain to the patient; and, as the matter ſtill continued to flow copiouſly, I ſoon drew off about a pound of it, of the colour and conſiſtence of thick yellow cream. I then ſtopped the flow of the matter, by putting a cork in the canula; and ſecured it in its place by means of a piece of tape put round the cheſt, and over each ſhoulder. The ſides of the wound were then drawn as cloſe to the canula as poſſible, by means of adheſive ſtraps, and the patient was covered up where he lay, for ſix hours; after which I took out the cork, and again allowed ſix ounces of matter of the ſame kind to flow out. By theſe evacuations the patient found his breathing much relieved, and the pain diminiſhed; ſo that he was now lifted upon the matreſs where he lay, by four ſtrong young men, and, without any inconvenience, placed upon a bed. He had now ſome rice boiled in milk, a diſh of which he was luckily very fond; and he found himſelf ſo well, that he told me I had made him a new man in an inſtant. During the night he ſlept better than he had done for many days before, though his opiate was not at all increaſed. His food was of the lighteſt kind; he was never

permitted to ſpeak; and, during the firſt four days, I drew off about twelve ounces of matter, morning and evening, but never drew off the whole at once. For this I had two reaſons. 1. That I might prevent, in ſome degree, too great a dilatation of the veſſels of the lungs by reaſon of the preſſure of the matter being taken off from them; and, 2. To prevent, in the moſt effectual manner, the admiſſion of air into the cavity of the thorax. By perſevering in the regimen juſt mentioned, the patient's health continued to amend daily, and the diſcharge of matter gradually to diminiſh, ſo that, in three months from the time of the operation, the internal abſceſs was completely healed, and the external wound entirely filled up.

From the conſtruction of the canula, (being perforated with large holes on each ſide to within an inch of the top), it is eaſy to ſee how the matter could enter the tube in every direction; and, from its being furniſhed with an oval head, convex to the intercoſtal muſcles, and concave on the outer part, it is likewiſe evident, that it was impoſſible for it to fall into the cavity of the thorax. I entered it with the flat ſide to the ribs; in which poſition I could puſh it up to the very head, without any danger.

It will be proper for a ſurgeon to have ſeveral canulas of this kind, for deep wounds of the lungs,

lungs, and where there is danger of the external opening being healed up before the internal wound is thoroughly cured. By the introduction of one of the canulas juſt mentioned, we will not only prevent the wound from cloſing, but give a free diſcharge to the matter as faſt as it is formed. Abſceſs in the lungs is no otherwiſe the conſequence of wounds, than by not keeping open the external orifice of the wound until the matter is diſcharged, and the whole ſinus in the lungs completely filled up from the bottom. Where this is not done, the matter collects in that part of the internal wound which was not completely healed up. By degrees this collection increaſes; and we know that it does ſo by the increaſe of cough, difficulty of breathing, and pain in the ſide, immediately under the cicatrix of the old wound; and both theſe ſymptoms are conſtantly augmented by lying upon the oppoſite ſide. Frequent rigors take place, with exacerbations morning and evening, quick pulſe, and hectic ſweats. Theſe ſymptoms fully ſhow that matter has been formed a ſecond time; and the quantity of it will always be in ſome meaſure indicated by the violence of the ſymptoms, and the length of time it has been in collecting. In ſuch caſes, the patient muſt evidently be in great danger; and this danger can only be removed

moved by making a freſh opening, and allowing the matter to diſcharge itſelf. For this purpoſe, an inciſion is to be made in the integuments, of about two inches long, continuing it down through the intercoſtal muſcles to the pleura, and the trocar ought to be uſed as directed. A modern writer on ſurgery has, however, directed, that, when this inciſion is made, the parts within ought to be examined by the finger; but, from the anatomy of the parts, this is evidently impoſſible. The ribs lie too near to one another to admit the introduction of a finger above half an inch between them; excepting only about an inch on each ſide of the ſternum. In this place I hope none will attempt to introduce their finger; though we have been told that it has been done by ſome, who puſhed it into the breaſt the whole length of it; and not only the finger, but a biſtoury alongſt it. If this, however, is done, there is no ſmall chance of lodging both finger and knife in one of the cavities of the heart. In ſhort, it is moſt evident, not only that it is impoſſible to introduce the finger between the ribs, but that nothing can be introduced, excepting the flat-ſided trocar already deſcribed; and indeed, the abſurdity of paſſing ſuch a large body as the finger into the cavity of the breaſt its whole length, were it even poſſible, and attempting to cut upon it, muſt be very evident. The hæmorrhage produced by ſuch an operation would

would almoſt certainly deſtroy the patient at once; but, if any one ſhould ſtill deny the impoſſibility of introducing a finger between the ribs, at the diſtance of three inches from the ſternum, he may eaſily ſatisfy himſelf the firſt time he is witneſs to any diſſection; or, if he be near an anatomical theatre, where he can have acceſs to a ſubject, he will find that he cannot introduce the point of his forefinger above half an inch between the ribs; and the nearer he approaches to the ſpine, the leſs ſpace there is between them. The contrary, I know hath been aſſerted; but, even though it were ſo, I cannot ſee any advantage that could be derived from our finger as a directory to lead us to this abſceſs; for, the lungs being compoſed entirely of air-veſſels and blood-veſſels, muſt have the ſame elaſtic feel throughout their whole ſurface, by which means it is impoſſible for us to aſcertain the ſeat of the abſceſs, as it has always the ſame feel with the reſt. If, therefore, notwithſtanding all theſe objections, we are told that a finger may be introduced, and has been ſo, into the cavity of the thorax, or rather the ſubſtance of the lungs themſelves, in this manner, we may ſurely, with more eaſe to the patient, as well as with leſs danger, paſs a flat trocar, and canula of the ſame length, into the lungs; and we will, by the diſcharge of matter along the groove, know when the abſceſs is penetrated.

When

When operations of this kind are performed, it will be proper not to diſcharge all the matter at once. It ought always to be evacuated by degrees, to prevent the too great expanſion of the veſſels, after the preſſure of the matter is taken of. It is evident, that, for the purpoſe of evacuating the matter, no tents can ever be as uſeful as the canula we have recommended; for, when this is uſed, we may eaſily prevent any quantity of air from entering the cavity of the thorax, which is always found to be pernicious when admitted into any of the cavities of the body. On the contrary, when we make uſe of a tent in any wound, the air muſt certainly have admiſſion. It is evidently impoſſible that we can cure a wound of any depth without ſome contrivance to prevent the parts from healing externally before the cavity is filled up. In gunſhot wounds, particularly in the ſternum, it is abſolutely neceſſary, in order to extract all foreign ſubſtances, to take out one or more pieces of the bone by means of a large trepan; by which means we will alſo give vent to whatever quantity of matter is afterwards formed. When this is done, which is to be accompliſhed in the ſame manner as in trepanning the cranium, the wound ought to be carefully covered up from the air, and the patient placed in ſuch a manner as to make the wound the moſt dependent part of

of the cheſt, by which means all the blood, ſerum, &c. extravaſated in the cavity of the thorax, may be diſcharged through the orifice.

## SECTION XI.

### *WOUNDS IN THE TEGUMENTS AND MUSCLES OF THE ABDOMEN.*

WHEN theſe are ſufficiently large to admit the finger, we will always be able exactly to determine the depth of the wound; and, as this cavity, as well as the thorax, is always quite filled with the bowels it contains, we will always know by the protruſion of ſome part of theſe bowels, whether the cavity be penetrated or not. We may alſo judge pretty well of the depth of the wound, from the direction in which it was inflicted. It is not common for any great hæmorrhage to enſue from wounds which only affect the integuments of the abdomen, as the only artery of any conſequence in theſe parts is the epigaſtric, which runs upon the interior and lateral parts of the abdomen, parallel to the rectus muſcle. If this veſſel happens to be divided, we muſt take it up as quickly as poſſible, by the tenaculum;

tenaculum; and, if we are certain that the wound has not perforated the cavity, we muſt inſtantly bring the ſides of it together by ſutures, or by means of adheſive ſtraps; and keep them in that poſition till it be completely cicatrized. But, if the wound is of conſiderable extent, and the muſcles alſo divided, we muſt take as much care as poſſible to prevent the patient from moving his body, leſt ſome of the bowels ſhould be forced out through the wound along with the peritonæum; for this membrane is extremely dilatable, and may be extended to ſuch a degree as to allow almoſt all the contents of the abdomen to protrude, without any rupture of itſelf.

This protuſion of the bowels is always ready to happen, unleſs great care be taken, both on the part of the patient and ſurgeon. The proper method of avoiding ſuch an accident, is by ſupporting the muſcles during the whole time of the cure, by means of a ſtrong flannel bandage put twice or thrice round the body. The inflammation muſt be kept down by all poſſible methods, and every medicine applied which has been mentioned when treating of inflammation.

It may happen, in wounds of the abdomen, as in thoſe of the thorax, that the cavity may be juſt penetrated, without injuring any of the viſcera

viſcera; and there are indeed many inſtances where the integuments of this cavity have been laid open for a conſiderable way, without any wound in the bowels; and the ſame thing alſo may happen in wounds of ſmaller extent. The danger in thoſe wounds ariſes not from the injury done to the integuments, but from the acceſs of the external air, which always raiſes a violent inflammation, when it has acceſs to any of the cavities of the body. Hence it is no uncommon thing for wounds which penetrate the abdomen to put on no dangerous appearances at firſt, and yet often terminate fatally. The danger of ſuch wounds, however, may ariſe, not only from the acceſs of external air, but from bad management of the external wound. It may proceed from a neglect of ſhutting up the wound, ſo as to keep the air immediately out of the cavity. This muſt be done in wounds of ſmall extent, by drawing together the ſides, by means of adheſive plaſters, and then covering the wound with pledgits of caddice, dipped in Wade's balſam, which will ſo effectually exclude the air, that the bowels cannot be any way affected. But, ſhould they, before the ſurgeon has an opportunity of doing this, happen to be affected by the air admitted during the time of inflicting the injury, or immediately after, we muſt endeavour to remove the inflammation by a diligent ap-

plication of all the medicines proper for the purpoſe, and which have been enumerated under the heads of inflammation and hernia. In caſes of this kind, repeated and large blood-lettings, and bladders filled with warm water, and applied to the belly, are particularly uſeful. Emollient injections are likewiſe uſeful; and, after the inflammatory ſymptoms have been in ſome meaſure overcome, we may adminiſter anodyne clyſters with the greateſt advantage. Thus, every inflammation affecting the ſurface of the inteſtines may, with proper perſeverance, be ſubdued; and it is evident, from the ſymptoms attending the enteritis, or inflammation of the inteſtines, where it terminates in ſuppuration and death, that the matter is collected only in very ſmall quantities on the ſurface of the ſmall guts, forming a kind of inflammatory cruſt upon them; which even glues the different portions of the gut to one another, though no collection of any conſequence is ever made within the cavity of the abdomen. So ſmall indeed is this collection, that when collected with the utmoſt care, it would not meaſure above ſix ounces, and could not therefore be called a large collection. Thus, I ſhould ſuppoſe, muſt every inflammation of the bowels terminate, which ariſes from expoſing them to cold, or to any other thing by which an inflammation may be produced. On this account, I am of opinion that this inflammation

tion will not terminate in large abſceſſes, but in what are called ſerous exſudations, which on the ſurface of the inteſtines appear like matter; inducing death only by the adheſions which take place through all the convolutions of the guts, producing a tendency to mortification at the ſame time. In all wounds, therefore, which penetrate the cavity of the abdomen, our firſt care muſt be, after having tied up any veſſel which bleeds to a conſiderable degree, to bring the edges of the wound as cloſe together as poſſible, and retain them in that poſition by means of the twiſted or interrupted ſutures. Having provided ſeveral long and flat threads, well waxed, with a needle upon each end, and having threaded as many needles as we think neceſſary, the patient is to be laid upon his back, with the breech and ſhoulders ſomewhat raiſed, ſo that we may relax, as much as poſſible, all the muſcles. The protruded inteſtines are then to be reduced; the ſurgeon is to introduce the forefinger of the right-hand, about half an inch within the wound. He then introduces the point of the needle immediately on the outſide of the peritonæum, puſhing it forward between that membrane and the muſcles, for about three quarters of an inch from the external edge of the wound. Having thus carefully introduced all the ligatures, both on the one ſide of the wound and the other, we muſt cauſe the aſſiſtant ſupport the ſides of it in cloſe

close contact with each other, while the surgeon ties each ligature with a running knot, through the whole extent of the wound; keeping about three quarters of an inch between the stitches; after which, a large pledgit, spread with emollient ointment, is to be laid over the whole wound, keeping the parts all firm, by means of a flannel roller.

Having dressed the wound in this manner, the patient must be put to bed, and kept very quiet, and treated with the greatest care in every respect. His food must be of the lightest kind, and the inflammatory symptoms relieved as soon as possible, by blood-letting, and the other proper methods. Indeed, in cases of this kind, almost the whole cure depends upon blood-letting, used in a judicious manner; but, where the wound is very small, it will generally be sufficient to draw it together by adhesive straps; particularly if we apply a roller over the whole; the proper methods for preventing and allaying inflammation being taken, as already directed.

We are told, indeed, by a modern writer on surgery, that, in wounds of this kind, the symptoms sometimes terminate in large collections of matter within the abdomen, and that, in such cases, the matter lies very deep. But to this I must oppose my own experience. In all cases of enteritis that I have observed, where the patient

tient died in conſequence of the formation of matter, upon opening the body, I never have ſeen a collection of any quantity of matter. I can eaſily conceive, that, in a caſe of a ſuppurated kidney, a conſiderable abſceſs may be formed; and, in the liver, I have ſeen ſuch collections formed, as nearly to deſtroy the whole ſubſtance of that organ; nay, I have even ſeen large collections of matter in the ovaria; and, in three caſes, where women had ſuffered greatly in child-birth, I have met with large collections of matter in the parietes of the abdomen. At firſt, all theſe had the appearance of collections in the abdomen itſelf; but, as ſoon as the matter was formed, although, indeed, it appeared at firſt to be very deeply ſeated, the abſceſſes gradually pointed outwards, and, in two months, broke externally, diſcharging a great quantity of well digeſted pus. After the matter had been diſcharged for near a fortnight, I was ſurpriſed to find, that, in all the three, there was likewiſe a diſcharge of excrements through the wound, and that in conſiderable quantity at firſt. No method, however, was taken to remove this ſymptom, farther than keeping the wound open, and applying an emollient cataplaſm twice a-day, until the hardneſs was quite removed. After this, the purulent diſcharge gradually diminiſhed; and, as ſoon as the openings began to contract, the diſcharge of

fæces

fæces ſtopped; and, in ſix weeks from the breaking of the abſceſs, the whole was cicatrized.

Some time after theſe caſes had fallen under my obſervation, I was called by one of my brethren to viſit a lady who had two openings in the abdomen, the one two inches on the left ſide of the navel, the other nearly at the ſame diſtance from the right ſide; from both of which a conſiderable quantity of fæces was diſcharged. On examining into this caſe, I found that the patient had been ſeized with a ſlight pain about the umbilicus, after what ſhe imagined to be a ſprain from having over-reached herſelf. Little attention was paid to this at firſt, as thinking the pain would go off in a day or two by reſt and warmth. But this was ſo far from being the caſe, that not only the pain conſtantly increaſed, but ſhe began to perceive a fullneſs about the place, on which her ſurgeon was ſent for. On examining the part, he felt a little hardneſs very deeply ſeated as he thought. The pulſe being full, ſhe was blooded freely, and her belly rubbed with camphorated liniment to eaſe the pain, which was very ſevere. But this, and all other methods of treatment, though uſed in the moſt judicious manner, proving ineffectual, the pain and ſwelling increaſed to ſuch a degree, that the ſurgeon was at laſt convinced that a very extenſive

ſive abſceſs had been formed all about the navel. Emollient poultices were now regularly applied, the ſurface of them being covered with the uſual heating reſins to promote ſuppuration; but it was not until many months after that the abſceſs pointed outwards on the left ſide of the navel. As ſoon as the ſuppuration appeared to be complete, the tumor was opened with the common abſceſs lancet, and a great diſcharge of purulent matter took place, which gave great relief; the emollient poultice was ſtill continued, but there remained ſtill a hardneſs all over the fore part of the abdomen. By the free and conſtant diſcharge of matter at the orifice, the hardneſs of the left ſide gradually diminiſhed; but that on the right ſide continually increaſed, until at laſt a fluctuation being felt there, a puncture was made on that ſide alſo, and a great quantity of matter diſcharged, to the great relief of the patient. By the application of poultices, the hardneſs began to go off; but, in about two months after the openings had been made, the orifice on the left ſide began to diſcharge fæculent matter; and, in two weeks more, the ſame made its appearance on the right. When I was called, (about fourteen months after the firſt orifice had been made), the diſcharge of purulent matter was almoſt entirely dried up, and nothing but fæces diſcharged from the openings. The patient

patient had no pain, and was ſo well, that ſhe could ſit up, and walk through the room, but wiſhed very much to have theſe openings cloſed, as they were now become exceedingly diſagreeable. I firſt introduced a probe into one of the orifices, and puſhing it towards the oppoſite ſide, I was fortunate enough to direct it to the other orifice, ſo that I could feel the point of it with another probe introduced at that orifice. It then ſeemed plain to me, that, during the inflammatory ſtage of the tumor, a portion of the ſmall gut had adhered to the inflamed peritonæum; and that, during the tedious ſuppuration, the coats of the inteſtine had been ſo weakened, that at laſt they had given way, ſo that two ſmall openings were formed, through which the fæces paſſed. Finding both openings completely callous, there was no hope of them ever healing up. The only thing, therefore, we could do, was to plug up each of the orifices with a ſmall doſſil of caddice, which gave great relief, by preventing the diſcharge during the remainder of her life, which was about eighteen months after I firſt ſaw her.

In all the caſes I have mentioned, it is evident that the abſceſs was on the outſide of the peritonæum; and that much pain and trouble might have been ſaved to the patient, if a trocar, or even a common abſceſs lancet, had been puſhed into

into the inflamed place, as ſoon as there were any ſigns of the formation of matter. I am, indeed, clearly of opinion, that, whatever collections of matter may be formed in the cavity of the abdomen, they always have their ſeat in the kidney, liver, or ſome of the other viſcera, and not on the ſurface of the omentum or bowels. In caſes of this kind, where the abſceſs is ſeated in any of the viſcera, when it burſts inwardly, the matter diffuſes itſelf over all the cavity of the abdomen, and death enſues almoſt inſtantly, without any poſſibility of preventing it, even though the moſt dextrous ſurgeon in the world ſhould be ſtanding by with a trocar ready to evacuate the matter the very moment the abſceſs burſts. There are many inſtances on record, where the effuſion of a quantity of matter into the cavity of the abdomen has occaſioned the moſt excruciating pains, and death in a very ſhort time. A modern writer on ſurgery, indeed, has aſſerted, that pus might be contained in the cavity of the abdomen without any inconvenience. He even mentions two caſes, both of which terminated fatally, where the abſceſs was opened; and, though only a ſmall opening was made by a ſcalpel, the moſt violent inflammatory ſymptoms took place during the firſt two days, and death very ſoon enſued. But, from what I myſelf have obſerved, I am tho-

roughly convinced that no quantity of matter is ever lodged within the peritonæum, unleſs contained within ſome particular viſcus. It is indeed evident to any perſon of common ſenſe, that no collection of matter can be included within the peritonæum, without being, at the ſame time, diffuſed all over the bowels at large; ſo that the cavity of the abdomen muſt have contained an immenſe quantity of matter indeed, before it could be diſtended in any very great degree; for the contents of an abſceſs are very ſmall, when compared with the quantity of water which conſtitutes an aſcites. Though our author, therefore, informs us that he has, by means of the trocar, drawn off great quantities of matter from the abdomen, I cannot give him any credit, being thoroughly convinced that the abſceſs has gone no deeper than the integuments. Nay, even in the two fatal caſes juſt mentioned, a ſmall opening was made into each of them with a ſcalpel. I reckon it quite certain that they had afterwards broke inwardly; and that the death of the patients had been immediately owing to this internal rupture, by which the pus had been all at once diffuſed over the bowels. Indeed, conſidering the thickneſs of the integuments of the abdomen, it is impoſſible for us to think otherwiſe. In the moſt emaciated patients, the thickneſs of theſe integuments is not

leſs

leſs than an inch; and, in thoſe of an ordinary habit, the diſtance from the ſurface to the peritonæum is ſeldom leſs than two. Any opening with a ſcalpel, therefore, unleſs very large indeed, could never have penetrated the cavity of the abdomen at once; and, of conſequence, I muſt look upon the whole of this author's theory as erroneous.

But, there is another and very dangerous ſpecies of this kind of wounds, viz. where the cavity of the abdomen is penetrated, and part of the contents have protruded through the wound. When this happens, the danger is generally in proportion to the time the bowels have been expoſed to the air; for which reaſon, we muſt return the protruded parts as quickly as poſſible. Care muſt be taken, however, that they be not ſoiled with any filth or heterogeneous matter; and, to avoid this, we muſt waſh them with warm milk, or with warm water, if there be no milk at hand. This being done, the patient muſt be laid upon his back, in ſuch a poſition, that all the muſcles of the abdomen may be relaxed, by which the return of the inteſtines will be facilitated; but, if they ſhould ſtill be found to protrude, we muſt endeavour to return that part which lies neareſt the wound; and, as ſoon as any portion begins to go back, the whole will follow in a very ſhort time. No farther enlarge-

ment

ment of the wound will generally be found neceſſary; but, if it ſhould, which, however, I doubt, the under part of the wound may eaſily be enlarged, and then the bowels being laid hold of with a warm moiſt cloth, the aſſiſtant is to pull them gently upwards towards himſelf, till the under part of the wound comes fairly within the view of the operator. The latter ought now to begin, by dividing the ſkin, cellular ſubſtance, and muſcles, down to the peritonæum. This membrane may now be very eaſily ſtretched; but it will be better to divide it with a probe pointed biſtoury introduced for about an inch along the finger, or juſt as much as will allow the bowels to return of themſelves; for, the leſs they are handled, ſo much the better.

As ſoon as the bowels are returned, we muſt bring the ſides of the wound together, by means of the interrupted future, as already directed, and then dreſs the wound in ſuch a way as to exclude the air as much as poſſible. The parts will unite as in other wounds, and the ligatures may generally be taken out in five or ſix days; but, as the bowels will ſtill be liable to protrude, and to form hernias, it will be found neceſſary to compreſs the weak part for ſome time longer, by means of a flannel roller; and the utmoſt care muſt be taken to prevent any pain or inflammation from taking place in the belly; but,

as

as this cannot always be entirely prevented, we muſt remember, that, if a conſiderable tenſion comes on, it will be better to unlooſe the ſtitches, and to allow the wound to open a little, than to riſk the conſequences. The ſame methods are to be uſed here as in other caſes, viz. bleeding, gentle and cooling laxatives, fomentations, with an antiphlogiſtic regimen, and perfect reſt, as far as can be procured, both of body and mind.

## SECTION XII.

### *OF WOUNDS OF THE ABDOMINAL VISCERA.*

WOUNDS of this kind, even of the ſmalleſt ſize, are extremely dangerous. Thoſe of the alimentary canal are diſcovered by the fœtid ſmell which they emit, and by an effuſion of the contents of that part which is wounded, and which muſt evidently be very different, as the wound happens to be in the ſtomach, the ſmall or the great inteſtines. Beſides this diſcharge of the wounded part through the orifice, there is alſo a diſcharge of blood by the anus; the patient is affected with moſt violent gripes, ſevere ſickneſs and naufea, with extreme pain through

through the whole region of the abdomen; and theſe are ſucceeded by cold ſweats, hiccup, and faintings, which commonly terminate in death.

In wounds of the abdominal viſcera, eſpecially of the inteſtines, it would be of great ſervice to aſcertain the extent of the wound; but this cannot be done, unleſs the wounded parts protrude; for it would be highly improper, in order to attain this knowledge, to lay open the belly, and expoſe all thoſe tender viſcera to the miſchievous action of the cold air. In many caſes, however, we are certain, that, though the inteſtines have been wounded, yet the patients have perfectly recovered, though the wound was never ſeen. But, when the wounded gut happens to be protruded, we ought not by any means to replace it, until we have done every thing to prevent the effuſion of the fæces into the cavity of the abdomen; and this is moſt effectually done by ſome kind of future; and the one moſt commonly employed, is that called the *Glover's* future, and which, indeed, ſeems to be the beſt of all that have yet been propoſed. The moſt proper method of performing it, is with a fine round needle threaded with ſilk. The ſurgeon having brought the lips of the wound exactly into contact with each other, muſt perforate both, while in that poſition, introducing

troducing the needle into the gut about one twelfth of an inch from the edge of the wound on one ſide, and bringing it out at the ſame diſtance on the other. Having thus made one ſtitch, he is to bring the needle with the thread acroſs the wound, and make a ſecond in the ſame manner; and ſo on, until a ſufficient number are made to keep the ſides of the wound together throughout its whole length, leaving a a ſufficient length of thread hanging out at the orifice, to draw it all out when the wound in the inteſtine is healed. Thus, the wound will heal without any contraction of the inteſtine; and there is not any neceſſity for entering the needle always from the inſide of the gut, as ſome have adviſed; which it certainly muſt be much more difficult and aukward for the ſurgeon to perform, than in the other way. Neither can there, as ſome have pretended, be any danger in allowing the thread to hang out at the wound, as it can always be withdrawn when the wound is healed; but we cannot ſay what might be the conſequence of leaving two or three inches of thread lying looſe in the cavity of the abdomen. My opinion, therefore, is, that, in curing wounds of this kind, the thread ought always to be left hanging out of the orifice, ſo that we may take it away at pleaſure. In extenſive wounds of the inteſtines, alſo, where there is reaſon to fear,

that,

that, notwithſtanding the future, the wound may burſt open, we ought to keep the wounded gut in contact with the orifice in the peritonæum, until all danger be paſt of the wound burſting open again.

In all caſes of wounds in the inteſtines, we ought to ſtitch every divided part, if poſſible; but, if the gut be completely divided, and both ends hang out of the wound, we muſt bring the divided parts together, and keep them ſo, until they unite completely, which ought to be done with as little handling and expoſure to the air as poſſible; and to anſwer this intention as well as we can, it will be proper to ſtitch each end of the divided gut to the peritonæum on that ſide to which it belongs. Thus, it is evident, that, for ſome time, the fæces muſt be diſcharged by the wound; but there are many inſtances where the operation has perfectly ſucceeded, by the union of the divided ends of the gut, the fæces being diſcharged in the natural way, and the external wound in the abdomen healing up entirely. The dreſſings, in caſes of this kind, ought to be very light, ſo as to leave the wound completely open at that part where the gut is ſtitched. Dry lint ought to be employed, covered with ſeveral folds of linen, with a flannel bandage over all. No certain time for dreſſing can be ſpecified, it being only neceſſary that the patient

patient be kept regularly clean, and by this we are to regulate the times of dreſſing. Where this method was followed, I have met with caſes of patients being well in ſix, nine, or ten months; all of them, indeed, in caſes of hernia, where gangrene had come on, ſo that ſuch treatment was required.

Where the inteſtine is fairly divided, we may attempt the cure by other methods, particularly by inſinuating the upper end of the gut into the lower one, and retaining them there by a ſtitch. I hope it is hardly needful to remind ſurgeons, that, in caſes of this kind, they ought to diſtinguiſh carefully between the upper and under parts of the gut, which is eaſily done, as the fæces will always be found puſhed out from the upper part in a few minutes, by the periſtaltic motion of the inteſtines. As it is difficult, however, to make ſtitches here in a proper manner, ſome practitioners have reccommended to inſert a round ſubſtance into the cavity of the inteſtine. A ring of paſteboard has been recommended; but I do not remember that any author has ſpoke of this from his own experience. I ſhould think paſteboard improper, on account of its being inſoluble in the body. A roll of tallow has likewiſe been recommended, and no doubt this will melt in time; but I cannot help thinking, that, by reaſon of the accu-

mulation which muſt take place at firſt, as well as the ſtoppage of the periſtaltic motion, our hopes would be ultimately fruſtrated. By melting fiſh glue, and making it up into a proper conſiſtence with milk, I am apt to think that we might ſucceed better; the mixture being made of ſuch a conſiſtence as to reſiſt conſiderably, we might form it into a cylindrical ſhape, rather ſmaller than the internal diameter of the ſmall inteſtines, ſo that it may be eaſily introduced within the gut, the ſides being at leaſt one eighth of an inch thick. As this ſubſtance is perfectly ſoluble in warm moiſt fluids, it is evident, that, by the conſtant attrition of the inteſtinal canal upon it, and the warm vapour and moiſture which conſtantly have acceſs to it, it muſt in time be entirely diſſolved, while the circulation would not be in the leaſt impeded during the cure. Neither is there any danger from obſtruction in this caſe, as the contents of the inteſtines would eaſily be protruded through the hollow of the cylinder. The hardneſs of this ſubſtance would not be greater than tallow; and, as it inclined to melt, would gradually become ſofter. This cylindrical tube might conveniently be made three inches long, and one half of it inſerted into each end of the gut, and the ſtitches made quite round it.

Should

Should it happen, that, in a wound of this kind, either end of the gut ſhould return into the cavity of the abdomen, we are adviſed to ſtitch to the peritonæum that part of the gut which remains out of the cavity; and, if this happens to be the upper part, and the wound be ſituated prerty far down, we have it thus in our power to form an artificial anus; and the patient may recover, though not indeed without a very great inconvenience remaining through life. But, if the upper part of the divided inteſtine happens to ſlip into the abdomen, it is evident that the patient muſt inevitably die; becauſe it is impoſſible to prevent the contents of the inteſtines from being diſcharged into the cavity of the abdomen. To prevent, if poſſible, theſe fatal effects, it is the part of a ſkilful ſurgeon to put the patient in a proper poſition, and then, by laying open the wound, to find out that part of the inteſtines which has ſlipped into the cavity. After this is done, he muſt endeavour to unite the divided parts of the inteſtine by means of the hollow cylinder, as already related. Were it the under end of the inteſtine, however, which was loſt, I ſhould not attempt to perform this operation before I conſulted with the patient himſelf, whether he would ſubmit to the inconvenience of an artificial anus through life, or whether he would, in order to have the

fæces

fæces paſs in the natural way, ſubmit to an operation, with barely a poſſible chance of recovery. This mode of treatment is applicable, not only to wounds of the inteſtines made by a ſharp inſtrument, but to ſuch diviſions of them as happen naturally in conſequence of mortifications, as in caſes of ſtrangulated hernias, &c.

## SECTION XIII.

### *WOUNDS OF THE STOMACH.*

THESE are known by the direction of the inſtrument with which the wound was made; but more eſpecially by the violent ſymptoms which take place immediately after receiving the injury. Theſe are extreme ſickneſs, naufea, vomiting of blood, hiccup, debility, with a diſcharge from the wound of whatever is ſwallowed. Wounds of the left hypochondrium or epigaſtrium generally penetrate the ſtomach, alſo very oblique wounds of the lower belly; and, if the ſtomach happen to be much diſtended at the time, it is evident that it may be wounded, when it would have eſcaped uninjured had it been empty.

Wounds

Wounds of the ſtomach are generally fatal; however, we muſt not deſpair while any apparent poſſibility remains of aſſiſting the patient. The treatment is to be the ſame with that already directed in wounds of the bowels. Sometimes, if the wound happens to be in the anterior part of the ſtomach, we may unite the ſides of it by ſtitches, as already mentioned; but, if both ſides of it be penetrated, this can be of no uſe.

In all wounds of the lower belly, it will be proper for the patient to lie upon the wounded part, that any bloody or ſerous matter may be diſcharged by the orifice, inſtead of collecting in the cavity of the abdomen. In caſes of this kind, the patient muſt be put very ſtrictly upon an antiphlogiſtic regimen. Fruits, either raw, baked, or boiled, may be uſed with great advantage, as well as milk, which affords the greateſt quantity of nouriſhment, with the leaſt digeſtion. Jellies of all kinds are alſo very proper; but, along with this kind of diet, we muſt remember that the inflammation is to be reſiſted by copious and repeated blood-lettings, warm fomentations, and, in general, every thing recommended for that purpoſe under the head of inflammation. We may likewiſe obſerve, that, as in wounds of the ſtomach, it is abſolutely neceſſary, as much as poſſible, to avoid diſtenſion,

ſion, we muſt give no more, even of the lighteſt kind of food, than is ſufficient to preſerve life; and, even that is to be withheld, if we can preſerve life by means of nouriſhing glyſters.

## SECTION. XIV.

### *WOUNDS OF THE OMENTUM AND MESENTERY.*

We cannot know whether theſe parts be wounded, unleſs they be alſo protruded; and where any of the inteſtines are protruded, the meſentery muſt always be ſo in part, and the omentum will generally be puſhed out before them. The danger from wounds in theſe parts ariſes from the effuſion of blood or chyle into the cavity of the abdomen; and this is particularly to be dreaded where the meſentery is wounded, inſomuch, that, in deep ſeated wounds of this part, we may always conclude that the patient will die. The meſentery contains an immenſe number of ſmall glands, blood-veſſels, and veſſels for conveying the chyle; and, when any of theſe happen to be wounded, they will certainly pour out their contents into the cavity of the abdomen. Neither can we have any means

means of tying them up, unleſs they happen to be protruded along with the bowels; for we would inevitably deſtroy the patient, were we to lay open the abdomen to ſearch for them. If, however, the wounded part of the meſentery happens to be protruded, we may tie up the veſſels, leaving the ends of the thread hanging out of the wound; and thus the patient's life may be preſerved. Wounds of the omentum are leſs dangerous, by reaſon of its ſituation before the inteſtines, which gives us more free acceſs to it; and it will generally be protruded as often as it is wounded. A mortification, however, is apt to take place, if the part has been for any time expoſed to the cold; that part, therefore, which has mortified, or which we have good reaſon to believe will mortify, ought to be cut off, before the omentum is returned into the abdomen.

## SECTION XV.

### *WOUNDS OF THE LIVER AND GALL-BLADDER.*

THOUGH ſlight wounds of the liver have ſometimes been cured, yet we muſt always account thoſe which are deep, or any way extenſive, as very

very dangerous, by reaſon of the great quantity of blood flowing through that viſcus, and the ſoft texture of the liver itſelf, which renders it very apt to pour out a great quantity of blood from a ſmall wound. Injuries of the gall-bladder are ſtill worſe; as in ſuch caſes the bile is evacuated into the cavity of the abdomen, where its tendency to putrefaction ſoon produces the moſt fatal effects.

We know that the liver is wounded from the ſituation of the wound, and the direction of the inſtrument. As the whole right hypochondrium, with part of the epigaſtrium, is filled with the liver, we thence ſee, that, in all deep wounds of thoſe parts, there is great reaſon to fear that the liver is injured. We know this to be the caſe, by the diſcharge of a great quantity of very thick and black blood through the wound, by the diſcharge of bile, mixed with the blood, paſſed by ſtool, or ejected by vomiting. The white of the eyes, and ſurface of the whole body, become yellow, as in the jaundice; the abdomen ſwells, and becomes very tenſe, and a pain is felt ſtriking up to the top of the ſhoulder, ſometimes very ſeverely; which laſt is common in all inflammatory affections of the liver.

In wounds of the liver, all that can be done, is to prevent or put a ſtop to the hæmorrhage, which,

which, in this caſe, is apt to prove exceſſive, and to evacuate the collections of blood or bile which may be formed in the abdomen. The hæmorrhage is to be ſtopped by blood-letting, a very cool regimen, and keeping the patient very quiet; injecting large glyſters of milk and water, which may act as fomentations to the bowels; or a mixture of one gill of fine olive oil, mixed with three of fine ſtarch, about the thickneſs of common mucilage of gum arabic. Injections of this kind ought to be given frequently; and, that this may be done without any pain to the patient, we ought to cover the end of the pipe with a piece of the gut of a fowl, allowing about an inch of the gut to hang over it. But, as it will be impoſſible, in any caſe of a wounded liver, to prevent a very conſiderable effuſion of blood into the cavity of the abdomen, we muſt uſe our utmoſt endeavours to get it out, as the moſt fatal conſequences muſt undoubtedly attend its being allowed to remain there. This is to be attempted, by laying the patient upon the wounded part, depreſſing the head, and elevating the under part of the body; the wound in the integuments is alſo to be enlarged, ſo that a free diſcharge may be given to any collection of blood and bile which happens to be formed. We may alſo make an opening in the abdomen,

at the moſt dependent part, for the ſame purpoſe. Beſides the glyſters already mentioned, the belly muſt be kept open by mild purgatives; and nothing anſwers better than the ſal. ſodæ; but, indeed, it is much to be regretted, that deep wounds of the liver ſeldom or never terminate favourably; and, therefore, the ſurgeon ought never to give his patient much hope, or at leaſt, not to promiſe a certain cure; though, at the ſame time, he is not to deſpair, as long as any poſſibility appears of giving relief. As ſoon as every appearance of inflammation is gone, we muſt ſupport the patient's ſtrength by cordial medicines and diet, allowing him ſome wine, or other generous liquor, which may be moſt agreeable to him. Thus, we will have done every thing for the patient which his unfortunate circumſtances will admit of; and, if we cannot ſave him, we will at leaſt incur no blame, either from his friends, or our own conſciences.

Where the gall-bladder happens to be wounded, the caſe is ſtill more deplorable, and indeed may generally be conſidered as mortal. This can ſcarce ever happen without a large wound of the liver; at the ſame time, the gall-bladder being ſo covered with the former, that no weapon could get at it without paſſing through the liver. The only directions that can be given, are thoſe I have already laid down; only we

muſt be ſtill more dubious in our prognoſtic than where the liver only is wounded.

## SECTION XVI.

### *WOUNDS OF THE SPLEEN, PANCREAS, AND RECEPTACULUM CHYLI.*

FORMERLY it was ſuppoſed by phyſicians, that the ſpleen was not only an uſeleſs, but a pernicious part of the body; and experiments have been made, which tend to ſhow, that animals may live not only without it, but great part of the pancreas alſo. Nevertheleſs, wounds in theſe parts are certainly attended with great danger, on account of the vicinity of other important viſcera, and the large blood-veſſels, particularly thoſe belonging to the kidneys. There are not, indeed, any certain ſigns by which we can know when the ſpleen is wounded. The moſt remarkable, is the colour of the blood, which, in this viſcus, is as remarkably red, as in the liver it is remarkably dark. Mr Hewſon ſuppoſed that the office of this organ was to prepare the red central globules of the blood; but, had this been

been the caſe, it ſeems impoſſible that any animal could live, while ſuch an important operation has ceaſed throughout the body; and we are certain that wounds in the ſpleen, unattended with any other injury, are not dangerous. The greateſt obſtacle to the cure of ſuch wounds, is the effuſion which unavoidably takes place in the cavity of the abdomen, more particularly when the duct of the pancreas happens to be divided; but no other directions can be given than thoſe already laid down in ſection 3d.

Wounds of the receptaculum chyli are almoſt always mortal, becauſe the body is thus entirely deprived of its nouriſhment; neither can any aſſiſtance be given them by ſurgery. The only thing that can be done, is to keep the patient very quiet, and with as little food as poſſible for a conſiderable time, when the wound in the veſſel may perhaps heal up. Wounds of this kind are known by the white liquor which is effuſed along with the blood; and the ſame methods ought to be taken to prevent any collection from taking place in the abdomen, as in other caſes.

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## SECTION XVII.

### *WOUNDS OF THE KIDNEYS AND URETERS.*

In a former part of this work, when treating of the operation of nephrotomy, I took notice of the extreme difficulty, or rather impoſſibility, of performing it; from the great thickneſs of the parts which muſt be divided before we can get at the kidney from behind. In the poſterior part, the viſcus is covered only by cellular ſubſtance, and united to the undermoſt ribs; on the fore part, it is covered by the peritonæum, behind which it lies, and is ſituated, ſo that it cannot be wounded without penetrating, not only the ſmall inteſtines, but the colon alſo; after which, the urine will be diſcharged through the wound of the kidney and peritonæum into the cavity of the abdomen. The caſe, however, muſt be different, if the kidney happens to be wounded in the back part, for then the urine will be diſcharged along with the blood through the wound.

The danger attending wounds in the anterior part of the kidney is evidently much greater than

than thoſe in the poſterior part, as, in the former, not only the inteſtines are wounded, but the urine will be diſcharged into the cavity of the abdomen; and hence ſuch wounds prove almoſt conſtantly mortal. The ſymptoms attending them are violent pains, not only in the region of the kidney, but over the whole abdomen, ſtriking down to the groin, extending along the penis, and ſometimes affecting the teſticles alſo; the urine is greatly mixed with blood, and the voiding of it accompanied with much pain and difficulty. The patient is likewiſe much affected by ſickneſs and vomiting; and all the ſymptoms growing continually worſe, death ſoon follows.

Where the kidney is wounded in the back part, all the ſymptoms are much milder. The urine, indeed, is diſcharged by the orifice, and may inſinuate itſelf into the cellular ſubſtance with which the kidney is covered; from which circumſtance the principal danger ariſes. But this may be obviated, by enlarging the orifice, and keeping it conſtantly open, to allow a free diſcharge of the blood and other matters which are apt to be collected in the wound, until the kidney be healed. For this purpoſe, a ſmall oval tube, ſomething reſembling that for an imperforated anus, may be made uſe of with ſucceſs, by allowing a free diſcharge of the urine.

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As wounds in the kidneys are attended with conſiderable hæmorrhagy, we muſt mitigate this by copious blood-letting; and by applying to the back, and region of the kidneys cloths ſeveral folds thick, moiſtened in vinegar and water. If we have the good fortune to ſtop the hæmorrhage, the great danger of the wound is over, and we may then proceed as already directed, keeping the patient as quiet and low as is conſiſtent with his health; though, indeed, after all we can do, it is probable that a fiſtulous opening will remain through life. The water, however, may always be drained off by the tube, which will prevent the neceſſity of uſing any cauſtic, or other ſevere means for keeping the wound open.

## SECTION XVIII.

### *WOUNDS OF THE BLADDER.*

THESE will differ conſiderably, according to the ſtate of contraction or diſtenſion in which the bladder is at the time of receiving the wound. While this viſcus is in its contracted ſtate, it lies wholly within the pelvis; but, when

when diſtended with urine, it riſes ſo far, that it ſometimes reaches to the umbilicus. It is evident, threfore, that, in a diſtended ſtate, the bladder may be penetrated by a wound, which, in its contracted ſtate, would not touch it. In its contracted ſtate alſo, the upper part of it may be affected by a wound, which, in its diſtended ſtate, would reach only to the lower part.

As the under part of the bladder is not covered by the peritonæum, it thence happens, that wounds in this part are not attended with any effuſion of urine into the cavity of the abdomen, which muſt unavoidably be the caſe where the upper part is wounded; and, hence, wounds of the upper part are neceſſarily more dangerous than thoſe of any other.

When only the neck of the bladder is wounded, the danger is very little, as is evident from the manifold inſtances there are of people recovering after the operation from the ſtone, in which this part is neceſſarily divided. But, when the wound is ſituated ſo high up that the urine flows into the cavity of the abdomen, the danger muſt always be very conſiderable; and we know that this is the caſe, when the patient's urine is quite ſuppreſſed in the natural way; for it is certain, that, when by a wound in the upper part of the bladder, the urine has ſuch

eaſy

eaſy acceſs into the cavity of the abdomen, it cannot overcome the contraction of the ſphincter veſicæ, ſo as to paſs into the urethra. The ſame thing muſt happen, if the bottom or back part of the bladder are wounded; and the ſymptoms uſually attending injuries of this kind, are, 1. A conſiderable diſcharge of blood mixed with urine through the wound. 2. Violent pains of the lower belly, along with a tenſion gradually increaſing. 3. No diſcharge of urine by the urethra; and, 4. A pain and ſwelling of the whole belly gradually increaſing. Theſe laſt ſymptoms are occaſioned by the continual accumulation of urine in the abdomen, and will ſoon prove fatal, if great care be not taken. The only method of removing them, is to enlarge the wound, ſo that every drop of urine may be evacuated from this cavity, where it produces ſuch miſchievous effects. When this fluid has immediate acceſs to the inteſtines, by being thus effuſed upon them, it produces ſuch violent inflammation, attended with excruciating pain, that the patient, for the moſt part, dies within thirty-ſix hours after the injury is received. (Quer. Might not a quantity of warm water, injected by the wound, prove uſeful in waſhing off this acrid liquor, and reſtoring the inteſtines to their former ſtate; for, though the

urine be as completely evacuated as poſſible, ſtill they muſt continue wet with it; and the inflammation will thus be kept up in a conſiderable degree, even after the evacuation has taken place).

A modern writer on ſurgery has directed us to ſew up wounds of the bladder with the glover's future, as we do thoſe of the inteſtines. But, though general directions of this kind may have a plauſible appearance, yet when we come to particulars, we ſhall find it not only difficult, but *impoſſible* to put it in practice without deſtroying the patient. In the firſt place, the bladder, in its contracted ſtate, ſhrinks to a very ſmall ſize, ſcarcely bigger than a large cheſnut or walnut when in a healthy ſtate; and in this ſituation, or nearly ſo, it would conſtantly remain, when, by means of a wound in its upper part, fundus, or back, the urine has free acceſs to the cavity of the abdomen, it will always be found in a contracted ſtate. Before we could get at it, therefore, we muſt enlarge the external wound as much as is ſufficient, to allow both the operator's hands to enter the bottom of the belly; and, when this is done, we muſt next pull out the wounded bladder, in order to make the future. While all this is doing, the ſmall inteſtines muſt neceſſarily be left hanging out, either at the ſides, or at the top of this large wound; and thus will be ſo much injured, that fatal

fatal conſequences will unavoidably enſue, though nothing elſe had happened to the patient. From the anatomy of the parts, indeed, I am certainly led to conclude, that the operation juſt now mentioned is altogether impracticable upon a living ſubject; and that in ſuch wounds the art of ſurgery can give no aſſiſtance. In every other wound, however, where the urine is diſcharged through the external orifice, we muſt endeavour to prevent it from inſinuating itſelf into the cellular ſubſtance, by enlarging the wound, and keeping it open, until the wound of the bladder be healed. The dreſſings ought to be very light, and the patient laid upon his face, with the pelvis elevated, ſo that the urine may be entirely diſcharged by the wound, until the bladder be healed. Great care muſt be taken throughout the cure to keep off the inflammation, by blood-letting and other proper methods recommended under that head. Warm fomentations to the belly are here particularly proper, as well as the application of a number of leeches to the ſides of the wound, and the injection of mucilaginous and anodyne glyſters. If the patient be very much troubled with naufea and vomiting, he muſt have a doſe of laudanum in half a mutchkin of ſtrong ſoup. The injections ought to be given pretty frequently. At firſt, one may be given every ſix hours; but, after

after the ſymptoms have abated, it will be ſufficient to give one morning and evening.

Thus, I have conſidered the method of treating wounds in the various parts of the body, thoſe of the uterus only excepted. Theſe, however, being fully treated of in every book of midwifery, I do not think it neceſſary to ſay any thing concerning them in this place, and ſhall therefore proceed to

## CHAPTER II.

## *OF BURNS.*

The immediate conſequence of theſe is violent inflammation, greater or leſs, according to the violence of the injury; and, according to the different appearances they put on, they may be divided into four different claſſes. 1. When the burnt part is affected only with a ſenſe of heat and inflammation. 2. When it is alſo accompanied with intenſe pain and veſication. 3. When the integuments are converted into an eſchar, by which the ſkin and cellular ſubſtance are entirely deſtroyed; and, 4. When all the parts are deſtroyed to the very bone. All theſe appearances

appearances cannot be produced by the ſame ſubſtance. Boiling water, for inſtance, though it will produce very intenſe pain, and deſtroy the ſkin, cannot produce any eſchar. Boiling oil, pitch, roſin, or wax, may produce a ſlight eſchar, and always will bliſter the part. Burning linen, cotton, or other coverings of the body, when ſet on fire, will ſoon deſtroy the unfortunate patient; but the moſt dreadful burns are produced by melted or ignited metals, which, it is evident, may deſtroy not only the ſoft parts, but the bones alſo. A burn by any liquid ſubſtance is more ſevere when it happens through the medium of the clothes, than when it falls directly upon the naked ſkin; becauſe thus the heat is applied for a conſiderable time without any diminution, or at leaſt with very little; and therefore affects the parts to ſuch a degree, that the ſkin almoſt conſtantly peels off with the clothes. Of this, we have innumerable inſtances when the legs are ſcalded through the ſtockings with boiling water; and burns of this kind are conſtantly attended with very violent pain, inflammation, &c. In the mildeſt kind of burns with melted metals, or hot iron, the cuticle is ſcorched, and becomes white, yellow, or brown, according to the degree of injury. Sometimes the ſkin is entirely converted into an hard eſchar, and then ſepa-

rates,

rates, as in any other caſe of mortification, leaving an ulcer more or leſs deep or wide, in proportion to the extent of the burn; but it is obſervable, that the pain attending injuries of this kind is much leſs when the ſkin is totally deſtroyed, than when it is not. The reaſon is, that thus the ſentient extremities of the cutaneous nerves are ſcorched, and rendered inſenſible, and thus the pain of the burn muſt be very much diminiſhed; while in thoſe caſes where veſications only are produced, the nerves remain moſt exquiſitely ſenſible, and the moſt violent pain is felt.

In all caſes of burns, the danger to the patient is exactly in proportion to the extent of the injury. Thus, for inſtance, where a perſon has unfortunately fallen into a large veſſel of boiling water, wort, &c. none of the remedies which are found efficacious, in caſes of leſſer burns, will here be of any uſe. The reaſon is, that, in ſuch violent injuries, the greateſt part of the cuticle is deſtroyed, and the exceſſive pain, irritation, and inflammation, excite ſuch a violent degree of fever, that the patient generally expires in a ſhort time. In ſome of thoſe caſes which have fallen under my obſervation, where the cuticle was almoſt entirely deſtroyed, the patient expired in thirty-ſix or forty hours in a ſtate of ſtupor. In very extenſive burns, by hot metals,

metals, or by inflamed combuſtibles, a moſt alarming degree of mortification takes place, ſo that ſometimes the patient is deſtroyed by it almoſt inſtantly; at others, he is waſted by the exceſſive diſcharge from the ulcer, and the effects of the air upon the ſurface of ſuch a large ſore.

Many things very contradictory to each other have been advanced by chirurgical authors upon the ſubject of burns. For inſtance, we have been told that the pain will be relieved, by plunging the part into cold water, or into boiling water; but, if the burn had been originally produced by boiling water, I muſt own myſelf entirely at a loſs to ſee how it can be remedied by the ſame thing which produced it. We know, indeed, that, when a finger or other part of the body is ſlightly burned, it will be relieved, by holding it as near the fire as we can; and repeating this two or three times over, we will find that the pain, though very much increaſed on the firſt application, will gradually ſubſide, and at laſt go off entirely. This may be explained, however, by the tone of the veſſels being reſtored by a degree of heat conſiderably inferior to that which produced the injury; but, were we to expoſe it to the very ſame degree, it is impoſſible but we muſt be made worſe by it. In like manner, if we happen to be burnt

burnt with boiling water, the tone of the parts will be reſtored, by putting it, for a ſhort time, twice or thrice into a veſſel of water fifty or ſixty degrees colder than that which occaſioned the injury; but, if the water be abſolutely *boiling*, it is as impoſſible that we can be any thing better, than we could be, after having burnt our fingers in the flame of the candle, by putting them into the middle of the fire. As to the effect of cold water, it is certain, that, keeping the part ſome time immerſed in it, the pain will ſoon be rendered very ſupportable, but it ſeldom goes off altogether; and, when bliſters have taken place, I have always ſeen that it does harm, by producing a greater degree of ſecondary inflammation (if I may call it ſo) than would otherwiſe have taken place.

Brandy or other ardent ſpirits have been much recommended in burns; and to me they ſeem to act in the very ſame manner that heat does, viz. as a ſtimulant. This appears from the pain which takes place immediately upon the application of the heat. That the pain may be completely removed, it is neceſſary that the application ſhould be continued for ſome time, or the part ſhould be immerſed for a proportionable time in the liquor. Solutions of ſacharum ſaturni, and other preparations of lead, have been recommended, as in the cure of other in-

flammations; but the moſt effectual remedy I have ever found in caſes of burns, either where the ſkin is quite ſound, or where it is bliſtered, but the veſications not broken, is that of white wine vinegar. Two or three folds of linen cloth, dipped in the beſt kind of this liquid, muſt be applied all over the burnt or ſcalded place; but if, by accident, any of the cuticle happens to be rubbed off, I apply over it a piece of linen cloth, exactly of the ſize of the ſore, moiſtened in the fineſt ſallad oil, covering the whole with the cloths dipped in vinegar, which are not to be removed, until both the pain and inflammation are entirely removed. Theſe cloths are to be kept conſtantly moiſt, by now and then pouring vinegar upon them out of a narrow mouthed vial; and we may eaſily change the oily application, by removing the cloth dipped in vinegar, whilſt we put on a freſh one dipped in oil. This oily cloth ought to be renewed every ſix hours. Thus, the pain and inflammation will generally go off in a very ſhort time; and that in the abraded part will commonly be removed in three days; after which, the cuticle heals exactly in the ſame manner as a common bliſter, and which we are to dreſs in the ſame way.

Aſtringent applications have been recommended in the cure of burns; but, from conſidering

the mode of cure by the remedies juſt mentioned, it is evident that they do not act by any aſtringent virtue; on the contrary, it is manifeſt that they have a reſolving and relaxing power. The firſt effect of this, is to prevent thoſe ſmall veſications which are occaſioned by ſuperficial burns; or if any ſmall ones have ariſen, it effectually prevents their increaſe; and hence, when the bliſters are juſt ariſing, which they do by ſmall and almoſt imperceptible puſtules which run afterwards into one, they generally put a ſtop to them, and no appearance of veſication enſues.

It hath been diſputed whether the bliſters which ariſe on burns ought to be opened, or let alone till they dry up of themſelves; but, from repeated experience, I am convinced, that, as ſoon as a bliſter of the ſize of a ſmall pea makes its appearance, it ought to be opened, by puſhing the point of a lancet gently into it with the flat ſide next the ſkin, and near the baſe of the bliſter, but taking care not to hurt the true ſkin which lies underneath. If the contrary method is followed, and the veſicle is ſuffered to remain whole, the veſſels which have once begun to pour out the ſerum will continue to do ſo; and thus the ſize of the bliſter muſt continually increaſe, becauſe more and more of the cuticle is forced away from the true ſkin, till the

the whole becomes like a blister made with Spanish flies, or even much larger, as in this way it, by degrees, extends itself over the whole scalded part. When this is the case, if the cuticle happens to be rubbed off after the blister is opened, which undoubtedly it must be, then a very severe inflammation takes place, owing to the admission of the air to such a large surface deprived of its natural covering; and, in such cases, it is by no means uncommon for the subsequent inflammation to spread beyond the limits of the original injury. Hence, it is a proverb, that a burn spreads for nine days before it discovers the least inclination to heal; nay, I have known them upwards of six weeks in healing, when they might easily have been healed in as many days, only by letting out every small vesication as soon as it appeared, and then applying brandy, or any kind of ardent spirits, solution of sugar of lead, acetum lythergyrites, or any thing similar, which will prevent the bad consequences already mentioned. These, as I have already mentioned, are owing to the effusion of serum between the cutis and cuticle, which, being confined, occasions a greater and greater separation, until the whole surface of the burn is covered with one continued blister; but this cannot happen when the small vesicles are opened as I have directed, and the above mentioned remedies applied. But, as it is a matter of great consequence to remove the

the pain of a burn as ſoon as poſſible, no time ought to be loſt in applying vinegar as ſoon as poſſible, which abates the pain ſooner than any thing elſe; indeed it has almoſt an inſtantaneous effect. In very extenſive burns, however, where ſome parts of the cuticle are deſtroyed, it will be proper to apply ſeveral folds of linen, moiſtened in fine ſallad oil, immediately to the tender ſkin, and above theſe the vinegar; becauſe we know not how far the latter might augment the pain and inflammation, or even produce a mortification; which, however, it never does when applied as has been directed. Along with theſe external applications, the patient, in very extenſive burns, ought to have a large doſe of laudanum, by which the ſenſe of pain will be abated, until the applications have had time to act. This ought to be repeated every ſix or eight hours, as occaſion may require, and the cooling applications continued, until the inflammation be entirely gone, which generally is in two or three days.

In caſes of very ſevere burns, where, notwithſtanding the above treatment, there is danger of a very ſevere inflammation taking place; bloodletting with the lancet is to be freely uſed, and cooling purgatives exhibited, as in other caſes of inflammation. Where the cuticle is rubbed off, the only external applications we can depend

pend upon, or which indeed the patient can bear, are thoſe of the oily kind. An ounce of ſimple ointment, rubbed in a glaſs mortar with two ounces of ſallad oil, anſwers the purpoſe perhaps better than any thing, and may be applied in the moſt ſevere burns, even when they have actually ulcerated. But, in thoſe produced by metallic bodies, where the ſkin, and perhaps the cellular membrane, is converted into an eſchar, we muſt have recourſe to vinegar, or to a liniment compoſed of equal parts of the beſt linſeed oil, and lime-water, which, by ſhaking, incorporate into a thick white ſubſtance, and generally give immediate eaſe. The beſt mode of applying this liniment, is by means of a feather dipped in it, with which the ſurface of the burn is to be wholly rubbed over; after which, the ſore muſt be covered with a piece of fine linen folded and dipped in the ſame, the application with the feather being conſtantly renewed as often as the cloth appears to be dry. In caſes of this kind, however, where large eſchars are apt to ſlough off, and extenſive and deep ulcers to be formed in conſequence, we muſt prevent, as much as poſſible, the ſpreading of the ſuppuration, farther than is abſolutely neceſſary to throw off the parts that are totally deſtroyed. After theſe parts are thrown off, it will be proper to dreſs the ſore in the ſame manner as in a

ſcald

ſcald or ſimple burn by ſcalding water. White cerate may alſo be uſed with ſucceſs, or the old unguentum ſaturninum of the Edinburgh Pharmacopœia. Care muſt be taken, where the fingers or toes are burnt or ſcalded, to keep them ſeparate during the cure, or the ſkin will be very apt to grow over both the adjacent ones, and thus make them adhere together.

In ſome caſes fungous fleſh is very apt to ariſe from the ulcers which ſucceed burns, which thus riſe conſiderably above the ſurface of the ſurrounding ſkin. This may be removed, by applying an ointment compoſed of one drachm and an half of alum well burnt and finely powdered, and rubbed with two drachms and an half of the beſt hogs lard. A gentle preſſure, by means of a compreſs and bandage, ought alſo to be made upon the part; and, along with this, we may likewiſe ſucceſsfully apply waſhes, made of a ſolution of alum, lime-water, or a decoction of oak.

Burns with gunpowder muſt be treated in the ſame manner as thoſe already mentioned; but, as it frequently happens that great irritation is occaſioned by ſome grains of the powder being forced into the ſkin, they ought carefully to be removed by the point of a lancet, or other ſharp inſtrument, as ſoon as poſſible after the accident. As the greateſt part of gunpowder conſiſts of nitre,

nitre, a ſalt very ſoluble in warm water, it will eaſily diſſolve where any moiſture has acceſs to it; the other two ingredients, ſulphur and charcoal, which will then be left in an exceeding fine powder, may be removed by the ſlighteſt lotion, or indeed by the ſerum or other matter produced from the burn itſelf.

## CHAPTER III.

## *OF TUMORS.*

WITHOUT ſpending time in attempting to define a tumor, or give an explanation of a word which cannot be made plainer, I ſhall begin with obſerving, that tumors, or ſwellings, in any part of the body, may be either inflammatory and acute, or chronic, which laſt are alſo called indolent. This diviſion ariſes from the peculiar nature of each; the acute or inflammatory tumors are attended with great pain, and other ſymptoms of inflammation, finiſhing their courſe in a ſhort time; while the chronic, or indolent, are attended with little or no pain for ſome time, and make but a ſlow progreſs compared with the

the others. Of the inflammatory tumors we ſhall treat in this place, according to their ſituation in the different parts of the body.

## SECTION I.

### *OF THE INFLAMMATION OF THE EAR.*

As the ſenſe of hearing entirely depends upon a healthy ſtate of the meatus auditorius, tympanum, &c. it is evident that every inflammatory tumor in theſe parts, which ends in ſuppuration, muſt be of a dangerous tendency. We ought, therefore, as much as poſſible to attempt the diſcuſſion of ſuch tumors, by the means already related under the head of Inflammation; but, if our endeavours in this reſpect ſhould prove unſucceſsful, and a collection of matter be formed, we muſt endeavour to evacuate it, and heal up the ſore as expeditiouſly as poſſible; for, if it be allowed to lodge for any length of time upon the tympanum, there is very great danger of that tender membrane being deſtroyed, which, of conſequence, would totally take away the ſenſe of hearing.

Inflammations

Inflammations of the meatus auditorius are always attended with great pain, by reaſon of the membraneous nature of the canal; and, from the cauſes formerly mentioned, affections of this part take place more frequently in children, when getting their firſt ſet of teeth, than at any other period in life. They are alſo frequent from the time of childhood to that of puberty; and, even after this, it is no uncommon thing to meet with patients complaining of a violent pain in the ear ariſing from a carious tooth, the pain beginning firſt in the latter, and afterwards attacking the ear, though pains of this kind are ſeldom attended with any tumor or ſuppuration.

When a ſurgeon is firſt called to a patient afflicted with an inflammation of the ear, if the diſorder has been but of ſhort ſtanding, we ought to attempt his relief by topical blood-letting, putting leeches round the whole root of the ear, and afterwards applying diſcutient poultices, made with the crumb of bread and ſaturnine ſolution, frequently filling the tube of the ear alſo with this ſolution. During the continuance of the pain, we ſhould keep the bowels moderately open, by means of gentle laxatives; and bliſters ſhould be applied behind the ear, and downward on the neck; or, in very ſevere

caſes, we may apply them alſo to the back of the neck. Should the pain continue very ſevere, we may add to the ſolution put into the ear ſix, eight, or more drops of laudanum; and, by this method, I have treated many patients very ſucceſsfully. But if, as it will ſometimes happen, we be diſappointed in our expectations, and from the continuance and increaſe of the pain and ſhooting pulſations there is reaſon to apprehend a ſuppuration, we ought then inſtantly to have recourſe to emollient cataplaſms applied all over the external ear, frequently filling the cavity with milk heated as much as the patient can bear, in order to bring the tumor as quickly to ſuppuration as poſſible. If, upon cauſing the light of the ſun to ſhine into the cavity, or looking into it with a candle, we can perceive the tumor riſing with a prominent point, we ought to wound it with a large darning needle. Thus, the matter will inſtantly be diſcharged with great relief to the patient; the diſcharge is to be promoted, by injections of warm milk and water applied twice or thrice a-day, filling the ear, between every time of injection, with a ſmall doſil of fine wool with a thread fixed to it, by which it may be pulled out. Thus, the external air, from the contact of which we have always ſo much to dread when any cavity of the body is injured, will be excluded,

excluded, and the abſceſs will generally heal up; nevertheleſs, it may ſometimes happen, that, in ſpite of every endeavour to the contrary, the diſcharge will continue and increaſe for ſeveral weeks, or even months; and then the beſt remedy is to make an iſſue in the back part of the neck of the ſize of a crown piece at leaſt, and to promote the diſcharge there by every method we can think of. While this is doing, we muſt fill the ear frequently with a ſolution of alum, or with lime-water, or a weak ſolution of lead; and thus, if the diſeaſe is entirely confined to the ſoft parts, it will ceaſe in a ſhort time; but, if the bones are otherwiſe affected, (which we know by the offenſive ſmell, and dark colour of the matter iſſuing from the ſore), we muſt then uſe injections of equal parts of tincture of bark, and tincture of myrrh, morning and evening, leaving the reſt to nature; but here, though the ſore may heal at laſt, the patient will be deaf for life.

SECT.

## SECTION II.

### *ANGINA, OR QUINSEY,*

Is a term applied to every inflammatory affection of the internal fauces; but that which comes under our notice at prefent, is what hath been called, by chirurgical writers, *cynanche tonfillaris*, being an affection of the mucous membranes of the fauces, efpecially the follicles which form the tonfils, and frequently fpreading from thence under the velum and uvula, fo as at times to affect both fides of the throat. It is always attended with fome degree of tumor, fometimes with a very confiderable one, with redneſs and pain of the parts, and difficulty of fwallowing. As the diſeaſe advances, the pain and fwelling increaſe, and the clammineſs of the mouth, from an inſpiſſation of the mucus, becomes very troubleſome; the pain alſo ſhoots into the ear, and there is a frequent expectoration, the whole being attended with a confiderable degree of fever. It is, however, not contagious, being occaſioned only by cold, particularly when applied to the neck, and, in general, attacks only the young and plethoric. It terminates frequently by

by reſolution, ſometimes by ſuppuration, but never by gangrene, though ſometimes ſloughy ſpots appear, which have been miſtaken as gangrenous. It attacks commonly in the ſpring and autumn, and generally attacks only one tonſil at firſt.

In the cure, topical bleeding is always of great uſe, ten or twelve leeches being applied on the affected ſide. It is alſo of uſe to puncture the affected tonſil frequently, holding down the tongue with a common paper folder, or any thing ſimilar. The point of a lancet is preferable to every other inſtrument for making the punctures. Gargles, or waſhes, of an infuſion of roſes, well acidulated with elixir of vitriol, or diluted nitrous acid, are of great ſervice; but nothing gives more relief than the ſteam of warm water inhaled through the apparatus, repreſented Vol. II. Pl. 6. Fig. 11. Should the diſeaſe ſtill continue to increaſe, however, we muſt have recourſe to bliſters. It will be proper to apply one to the affected ſide of the throat large enough to cover the whole of it; promoting, at the ſame time, a gentle diaphoreſis, by means of ſpiritus mindereri, and keeping the bowels open with proper laxatives.

By proceeding in this manner, I have conſtantly proved ſucceſsful in removing the diſeaſe; nor do I remember a ſingle inſtance in which a patient

patient of mine had an angina terminating in ſuppuration, excepting where he obſtinately refuſed to allow me to ſcarify his throat. Caſes, however, I doubt not, may occur where the diſeaſe goes on, and will terminate in ſuppuration, notwithſtanding every endeavour to prevent it. We ought then to endeavour, as much as poſſible, to bring the tumor to maturity, both by external and internal remedies. Theſe are large emollient cataplaſms applied to the outſide of the throat, with the ſteams of warm water, or infuſion of chamomile flowers, inhaled as above directed. We know that the ſuppuration is complete, when a ſmall prominence appears on ſome part of the tonſil, generally near its middle, from the violent pain in the throat ſhooting to the ear; and, if the tumor is of any ſize, the patient will be affected with ſhiverings, with an extreme difficulty, or rather impoſſibility, of ſwallowing any thing, either ſolid or liquid. Effectual relief may now be given to the patient, by opening the apex of the tumor with the point of a lancet, though it will ſometimes be neceſſary to puſh the inſtrument a little farther into the tumor than we at firſt expected; and, as the fine ſpear-pointed lancet gives very little pain, we ought to uſe it in preference to every other inſtrument. The diſcharge of the matter inſtantly removes the pain, and the ſwelling and tenſion ſubſide in a few

few hours, ſo that little or nothing but a proper diet is requiſite.

## SECTION. III.

### *INFLAMMATION AND ABSCESS OF THE LIVER.*

THIS diſeaſe is of two kinds, acute and chronic; but the latter is ſeldom diſcovered till after death. The former ſhows itſelf by ſevere pain in the right hypochondrium, ſometimes reſembling that of a pleuriſy, exaſperated by the preſſure of feeling it with the fingers, and the patient cannot lie but on the affected ſide. It frequently extends to the clavicle and top of the ſhoulder of the ſame ſide; and, in ſome patients, is attended with cough, hiccup, nauſea, and vomiting, and with a yellowneſs of the eyes. It may be produced by violent contuſions on the region of the liver, as by falls from horſes, or the like; by violent ſummer heats, which produce alſo remittent or intermittent fevers; or it may be occaſioned by cold, applied either externally or internally.

In this diſeaſe, called alſo the *hepatitis*, the hepatic arteries, with the membrane which covers

vers the liver, ſeem to be principally affected. That the membrane is principally concerned, appears from the degree of hiccup which conſtantly takes place when the convex ſide of the liver is affected with inflammation; for, as the inflamed membrane then comes in contact with the diaphragm, it is probable that ſome degree of inflammation may be communicated to it; and if, as ſometimes happens, an abſceſs of the liver burſts into the cavity of the thorax, we know that there muſt have been an inflammatory adheſion between them. Where the concave ſurface of the liver is affected, the pain is much deeper ſeated; and, inſtead of hiccup, the patient is afflicted with nauſea and vomiting; but in this caſe alſo, adheſions frequently take place between the liver and duodenum, and the abſceſs burſts into the inteſtinal canal. Adheſions of the inflammatory kind muſt alſo take place between the external membrane of the liver and peritonæum, when the abſceſs points externally alongſt the edges of the falſe ribs. This inflammation, ſpreading along the ſurface of the liver, communicates itſelf alſo to the biliary ducts and gall-bladder, thus producing the jaundiced appearance already taken notice of. The pain in the ſhoulder, though frequent in the inflammatory ſtage of this diſorder, is yet much more ſo after matter has been formed.

Inflammations

Inflammations of the liver may be be terminated by reſolution, ſuppuration, or gangrene; and, like every other extenſive inflammation, it is attended with fever, beginning with coldneſs and ſhivering. The cure, in an incipient ſtate of the diſeaſe, ought to be attempted by large topical bloodlettings frequently repeated. Cupping with ſcarification, is here proper over all the region of the liver; the bowels are to be kept conſtantly open, by means of briſk ſaline purges, and we muſt alſo promote a conſtant diaphoreſis; for which laſt purpoſe, ſmall doſes of tartar emetic, repeated every two or three hours, are found to be moſt proper. Bliſters, of ſuch a ſize as to cover the whole region of the liver, are likewiſe of excellent uſe; and, by perſevering in theſe medicines, we may frequently cure the patient by reſolving the inflammation. But, ſhould this method fail, we have great reaſon to fear that a ſuppuration will enſue, particularly if the pain in the ſhoulder becomes more ſevere, and the patient is frequently attacked with fits of rigor. If any thing is ſtill capable of preventing this unfortunate event, it is the uſe of mercury; and the ſooner we can make it ſenſibly affect the ſyſtem, ſo much the better, keeping the belly open at the ſame time; for this laſt is alſo very uſeful for preventing large ſuppurations from taking place. Half an

ounce of ſtrong mercurial ointment ſhould be rubbed in morning and evening; the patient alſo taking every ſecond night a bolus of ſweet mercury, not leſs than ten grains to a doſe, with a grain of opium along with each. Here, from the warmth in which the patient muſt be kept, you will find the quantity of mercury neceſſary to affect the ſyſtem moſtly greater than when he is allowed to expoſe himſelf to the common air. In this method we muſt perſevere, until every ſymptom of pain and inflammation be totally removed; and, by giving the calomel in the manner directed, no other purgative will be neceſſary.

But though, by the above methods, we may frequently ſucceed, yet there are many inſtances where, in ſpite of every method, the diſeaſe will increaſe, and a ſuppuration take place. This is known by the ſize of the ſwelling in the region of the liver, particularly when the integuments along the edge of the falſe ribs appear œdomatous, when the pain of the ſhoulder begins to affect the neck and ſcapula, and the cold and ſhivering fits return with violence. In caſes of this kind, there can be no hope of remedy but by drawing off the matter; however, as very great danger muſt always attend the admiſſion of air into the ſubſtance of the liver, we muſt make a free inciſion only through the integuments

ments till we come to the peritonæum, and then draw off the matter by a trocar. This inſtrument is to be puſhed into the abſceſs, until the matter begins to flow freely along the groove of the ſtiletto, after which the latter muſt be withdrawn; but, as ſoon as the flux of matter begins to abate, the canula muſt be ſtopped with a cork, and ſecured in its place, by means of two pieces of linen tape paſſed through the two rings belonging to it. The reſt of the wound is then to be brought as nearly into contact as poſſible, and ſecured in that poſition by adheſive ſtraps; the whole being covered with a pledgit of mild emollient ointment. Having thus the diſcharge of the matter entirely in our power, we may let it off twice in twenty-four hours, but not in ſuch quantity as to allow the air to enter; and, therefore, the canula muſt always be ſtopped, at leaſt for the firſt two or three weeks, as ſoon as the diſcharge begins ſenſibly to abate.

But, though we may with conſiderable hope of ſucceſs perform this operation when the abſceſs is ſeated on the convex part of the liver, and an adheſion is formed between that viſcus and the peritonæum, yet I am bold to affirm, that, unleſs this be the caſe, we ought by no means to attempt any thing. Should the abſceſs be ſeated on the concave ſide, I preſume that

that no man in his ſenſes would attempt to make ſuch an inciſion into the cavity of the abdomen as could give him acceſs to the liver, for thus he would lay open almoſt all the bowels; and, even after he had done ſo, it would be impoſſible for him to diſcharge the matter without allowing it to fall on the bowels. Indeed, unleſs there has been an adheſion between the liver and ſome other part, it is almoſt impoſſible that an abſceſs of the liver can diſcharge itſelf any other way than into the cavity of the abdomen. There are inſtances, indeed, of its having diſcharged itſelf into the cavity of the bowels, by the biliary ducts, or directly into the colon; but all theſe have been in conſequence of inflammatory adheſions, and perforations made through the diaphragm, biliary ducts, or inteſtines. I do not ſay, indeed, but by ſome extraordinary operation of nature, the pus may be abſorbed, and thrown out by ſome natural evacuation. Inſtances of this kind perhaps have been obſerved; but they are ſo exceedingly rare, that we never can reaſonably expect them.

Having performed the operation under the favourable circumſtances above mentioned, and dreſſed the wound as directed, we will find it of conſiderable ſervice to apply a flannel bandage round the body of the patient, in order to compreſs the parts, and aſſiſt the union of the ſides

of

of the abſceſs, as ſoon as all the matter is diſcharged; the febrile ſymptoms under which the patient laboured will begin to go off, his appetite will increaſe, and other ſigns of convaleſcence take place. He ought now to be allowed a nouriſhing diet, with ſome cordial drink, either of wine or ſpirits, mixed with water, and agreeably ſweetened. The bark may alſo be now freely adminiſtered, which could not have been formerly done with ſafety; and, indeed, I am afraid that practitioners, in warm climates, where inflammations of the liver are very common, do frequently err in adminiſtering the bark too promiſcuouſly; for, while the inflammatory ſtage of this diſeaſe continues, the bark muſt certainly do harm.

There are inſtances of an abſceſs of the liver having penetrated not only the diaphragm, but the ſubſtance of the lungs alſo; in which caſe, the matter has been ſpat up, and the patient recovered. It is more common for it, however, after penetrating the diaphragm, to burſt into the cavity of the thorax. This is known by a ſudden tranſlation of the pain from the liver to the thorax, attended with extreme uneaſineſs, reſtleſſneſs, and difficulty of breathing. In like manner, when it burſts into the cavity of the abdomen, there is a tranſlation of the pain from the

the liver to the bowels, a fluctuation and fullneſs in that ſide on which the patient lies; and, as in the former caſe, the only hope of ſaving the patient from death lies in performing the operation for an empyema, ſo in the latter it lies in that of the paracenteſis, both which have been already deſcribed.

## SECTION IV.

### *INFLAMMATIONS AND ABSCESSES IN THE BREASTS OF WOMEN.*

These very ſeldom occur in young women, though very common in thoſe that give ſuck. In the former, any conſiderable injury of the breaſt will be attended with pain, heat, and hardneſs; but theſe never come to that height which is uſual when ſuppuration is about to take place; and, therefore, unleſs the patient be relieved by bleeding, and proper cooling applications, a ſchirrus moſt commonly enſues. The inflammatory affections of which we are here to treat, commonly ariſe after child-bearing, and are for the moſt part occaſioned by a ſtoppage of

of the milk from cold, or ſome imprudent management on the part of the patient, or her attendants. The diſeaſe begins with an ephemera, or what in Scotland we call a *weed*. The cold fit of this fever is always very ſevere, and laſts about an hour, notwithſtanding all the warm and ſtimulating drinks that can be given to remove it. It is then ſucceded by a hot one, which continues ſomewhat longer; and, during the continuance of this, the patient is ſeized with a fixed pain in one of her breaſts, commonly on the upper part, and near the nipple. Should a profuſe ſweat now come on, the pain will probably be relieved; and the more profuſe it is, the ſooner and more effectual will the relief be; but, if the hot fit ſhould prove very ſevere, without any conſiderable ſweat, the pain will certainly increaſe, with evident hardneſs, and tumor increaſing rapidly, until the whole breaſt at laſt becomes full and tenſe, with a painful ſenſation over the whole. This laſt, however, is commonly the effect of an accumulation of the milk; the greateſt hardneſs and tumor being ſeated ſo near the nipple, that ſhe cannot allow the child ſo ſuck but with great difficulty. If nothing is done for the relief of the patient, the diſeaſe continues to increaſe rapidly with great pain; and the tumor becomes ſo extenſive, that the whole breaſt is occupied by it, until at laſt

the

the patient is ſeized with fits of rigor, a ſure ſign of the formation of matter. The collection generally takes place at firſt about the root of the nipple; and, if ſtill left to nature, it increaſes to ſuch a degree as to extend itſelf through the whole tumor, with frequently a great diſcolouration of the ſkin, which appears of a livid colour, and often a ſpot of it ſphacelates, by which the whole abſceſs diſcharges itſelf at once, and the patient is relieved; the pain and tenſion gradually abate; and, if the abſceſs has been ſmall, the ſore frequently heals in a few days. It often happens, however, that no ſooner is one abſceſs healed, than another begins in its neighbourhood; and I have ſeen inſtances of one abſceſs thus ſucceeding another quickly in the ſame breaſt for no leſs than three months.

From the account juſt now given of the riſe and progreſs of this diſtemper, it is evident, that, as ſoon as a patient is ſeized with an ephemera, we ought to endeavour to ſhorten the cold fit as much as poſſible; and this is beſt done by exciting vomiting, without giving any thing hot or ſtimulating; but, if vomiting cannot be excited, we muſt wait till the fit goes off of itſelf. When the hot fit begins, we are to excite and keep up as powerful a perſpiration as poſſible, by giving the patient a table ſpoonful of ſpiritus mindereri

mindereri in a mixture of ſimple cinnamon water, with as much roſe water every two hours. Until the hot fit comes on, however, we ought by no means to give her any thing hot, much leſs to load her with bed-clothes; neither are we, after the perſpiration has once begun, to give the above directed medicine with the ſame quickneſs as at firſt; it will be ſufficient to give a doſe every four hours; and, after the ſweating has continued for about twelve hours, it will be proper to allow it to ſubſide, and go off; after which, her linen muſt be changed, taking care that ſhe does not catch cold; and, that the full benefit may be derived from the perſpiration, and no danger whatever incurred, it is obvious that the patient, during the time of ſweating, ought to be laid in blankets, for wet linen very ſoon becomes cool, and hurts the patient. But if, notwithſtanding all our care, a tumor ſhould ſtill be formed with all the circumſtances of heat, tenſion, &c. above mentioned, I have found nothing equally beneficial with topical blood-letting with leeches. Theſe are to be applied regularly every day, until every bad ſymptom diſappears; and, immediately after this is done, the breaſt muſt be fomented with a cloth folded ſeveral times, dipped in ſolution of ſugar of lead, and applied as warm as the patient can

bear it. This ſhould be frequently applied through the day; and, next morning, if the patient continues as well as before, the leeches muſt be renewed, and the ſame courſe followed exactly, until every bad ſymptom diſappears, keeping the bowels open by cooling injections.

By following the methods juſt now laid down, we will very often be ſucceſsful in preventing the formation of an abſceſs; yet ſometimes, from cauſes to us entirely unknown, a ſuppuration will take place, and even repeated collections of matter, as I have often ſeen. In all caſes of this kind, as ſoon as the tumor is properly ſuppurated, we ought to open it with the fine point of a lancet, carrying the inciſion almoſt entirely from the one ſide of the ſoft tumor to the other that the contents may be freely diſcharged. The wound is to be covered with a bit of linen ſpread with a little of the moſt emollient ointment; and an emollient poultice laid over the whole, ſuch as muſt alſo be applied when the tumor is obſtinately hard, and we wiſh to promote the formation of pus. This poultice is to be continued till all the hardneſs is gone; and, betwixt every two applications, the ſore ought to be covered pretty thick with Goulard's cerate.

If theſe directions are properly followed, every abſceſs in the breaſt may be cured in a very few days;

days; aud I firmly believe that there is hardly any inſtance to be met with where a ſchirrus took place in the breaſt in conſequence of any inflammation after child-birth. Indeed it is very ſeldom that an inflammation takes place here, after the woman has begun to ſuckle her child, or after ſhe has continued to do ſo for two or three months. When the breaſt, however, becomes very hard and painful, eſpecially if the tumor is ſeated about the root of the nipple, we ought by no means to torment the patient, by forcing her to attempt giving ſuck; for, after a breaſt is once thoroughly ſuppurated, it very ſeldom happens that it is again fit to be drawn. In all caſes where the pain is very acute, we ought to give the patient a doſe of laudanum, and to continue the uſe of the medicine as occaſion requires; for ſo far will this be from promoting the ſuppuration, that it will powerfully prevent it.

SECT.

## SECTION V.

### *INFLAMMATION OF THE TESTES.*

THIS may arife from a variety of cauſes, as bruiſes from falls, or otherwiſe; but they moſt commonly originate from gonorrhœas improperly ſtopped. It is but ſeldom, however, that it comes on at the beginning of the diſeaſe; nor, indeed, does it often appear, until all the inflammatory ſymptoms and pain have gone off, and the patient flatters himſelf with the hopes of being ſoon well. By this time, however, the inflammation has pervaded not only the urethra, but taken poſſeſſion of the neck of the bladder, caput gallinaginis, or ſeminal ſecretory ducts that open into the urethra from the veſiculæ ſeminales; and, as ſoon as the ſmalleſt ſenſe of pain and weight is felt in the epidydimis, where it always begins when the teſticle is about to ſwell, the running from the urethra ſtops altogether, or diminiſhes in quantity. If the diminution of the running is but ſmall, the ſwelling increaſes ſlowly, but very rapidly if it be totally ſuppreſſed. The pain of the epidydimis now becomes exquiſite

exquiſite on being handled; a ſwelling and hardneſs takes place in it, ſometimes twenty-four hours or more before any ſwelling comes on in the body of the teſticle itſelf; though, in far the greateſt number of caſes, the teſticle ſwells along with the epidydimis, and both together are affected with the moſt violent pain, heat, and ſenſe of weight. The ſpermatic cord then ſwells, and becomes very hard and painful, with a ſhooting pain throughout the whole courſe of it, by which even the loins and kidneys are ſometimes affected. Theſe ſymptoms are often attended with a very high degree of fever, reſtleſſneſs, and extremely quick pulſe, inſomuch that I have often felt it beat 120 in a minute, and ſhould have thought my patient in the greateſt danger, had I not known the cauſe. When the ſymptoms of inflammation run very high, the patient is frequently attacked with naufea and vomiting, by which the violence of the pain is always augmented; and, in ſhort, the ſeverity of the ſymptoms which affect the whole ſyſtem, bear an exact proportion to thoſe which affect the teſticle, cord, and parts adjacent. It is alſo remarkable, that neither the epidydimis nor teſticle are ever effected, until every ſymptom of pain and running has ceaſed from the urethra; and the more complete the ceſſation of theſe ſymptoms is,

is, the more ſevere will be the ſwelling and pain of the teſticle.

From this account of the ſymptoms attending an inflammation of the teſticle from a venereal cauſe, we may ſee that the proper indication of cure is, by every poſſible method, to recall the running and other attendants of a gonorrhœa, the preſent diſeaſe being in truth nothing more than a tranſlation of it from the urethra to the teſticle. A modern writer on ſurgery has, indeed, poſitively told us, that "no communication ſubſiſts between the urethra and teſticle, by which matter can be conveyed from the one to the other." But I would aſk this writer, if the caſe be as he repreſents it, how the ſemen of the male is conveyed from the teſticles into the urethra? As none can deny this to be a fact, may not the ſame tube convey the matter from the urethra to the teſticle, by paſſing in at one of the openings of the urethra, and continuing its courſe along the inſide of the veſiculæ ſeminales, till it comes to the opening of the vaſa deferentia of one of the teſticles, and through this tube communicate its baneful influence to all the parts of the ſeminal convoluted tubes of the teſticle itſelf. That this is really the caſe, ſeems extremely probable from the cauſes by which a ſwelled teſticle is brought on; theſe being ſuch as are very likely to bring on a retrograde

trograde motion in the ſyſtem, viz. draſtic purges, cold, acrid, and aſtringent injections, &c. Beſides, we find that the diſeaſe itſelf originally comes on in a ſimilar manner. Beginning near the top of the urethra, at the back of the glans, it gradually paſſes down that canal, until it reaches the very neck of the bladder; a progreſs, as far as we can judge, the very ſame with that ſuppoſed to be the courſe of the infection from the urethra itſelf to the teſticle.

However ſevere the ſymptoms of inflammation may be which attend a ſwelled teſticle, they terminate much leſs frequently in ſuppuration than in other parts of the body. Indeed we may ſay that no ſuppuration of this kind ever will take place, unleſs by much inattention and miſmanagement on the part of the ſurgeon or patient; nay, with proper care and attention, we may venture to ſay that a ſwelled teſticle might always be prevented. For this purpoſe, we ſhould ſeldom make uſe of any ſtrong aſtringent injections, nor ever allow the patient to expoſe himſelf to cold, by bathing the parts in cold water, or otherwiſe. Draſtic purges might alſo be avoided; and we ought to cauſe the patient ſuſpend his teſticle in a bag truſs throughout the whole courſe of the diſeaſe. But, if by any accident, ſuch as violent exerciſe on foot or horſeback, unavoidable expoſure to rain, &c.

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the teſticle ſhould happen to be affected, we ought inſtantly to have recourſe to blood-letting, eſpecially if the patient is young and plethoric. Indeed in no caſe whatever have I obſerved topical blood-letting of greater efficacy than the diſeaſe we treat of. Ten or twelve leeches ought therefore to be applied all over the teſticle, and their diſcharge promoted by a large emollient poultice ſufficient to cover not only the teſticle, but the penis alſo. The inteſtines ought to be emptied by a large emollient injection, which ought to be repeated occaſionally, until the ſwelling abates. As the pain is always extremely ſevere, it ought to be abated by large doſes of laudanum, the moſt proper vehicle for which is mucilage of gum arabic, or ſtarch boiled to the ſame conſiſtence. Six ounces of either of theſe, mixed with two ounces of oil, with the addition of ſixty drops of laudanum, thrown up as a glyſter, has often an aſtoniſhing effect in allaying the pain. The leeches ought to be frequently repeated, as well as the anodyne injections, if the pain and ſwelling continue; and the diſcharge muſt always be promoted by emollient poultices. The patient may alſo ſtay half an hour every day in the ſemicupium as warm as he can bear it; and the teſticle may be fomented frequently through the day, with a flannel cloth wrung out of ſtrong ſolution of lead. He muſt lie conſtantly in an horizontal poſture,

poſture, be kept on a low diet, and no injection of any kind by the urethra muſt be uſed; but every ſecond night we muſt give the patient five grains of calomel, purging it off in the morning with two ſcruples of compound powder of jalep.

When this courſe has been perſiſted in for two or three days at moſt, the running comes on again; the pain and ſwelling of the teſticle gradually ſubſide; and, if proper attention is paid by the ſurgeon and patient, the latter will generally be quite free from pain on the third or fourth day. He ſhould, however, for ſome time, continue to take, every night at bed-time, one grain of calomel, and one of calcined mercury. But if, through any unforſeen accident, or as it may ſometimes happen from an hereditary affection, we ſhould ſtill fail in removing the inflammation, and a ſuppuration ſhould take place, we ought to bring it forward as faſt as poſſible by emollient poultices. As ſoon as the matter is formed, we ought to diſcharge it, by making an opening with an abſceſs lancet in the moſt depending part, treating the ſore afterwards as we would do a collection of matter in any other part of the body.

## SECTION VI.

### *OF VENEREAL BUBOES.*

THE knowledge of the lymphatic ſyſtem, now ſo fully explained by late anatomiſts, throws great light upon the nature and cauſe, as well as the cure of many glandular ſwellings formerly very explicable. It is now demonſtrated that the lymphatics are a ſet of abſorbent veſſels diſperſed every where, not only over the ſurface of the ſkin, but over the internal ſurfaces of all the cavities and viſcera of the body. Hence, in any of the glandular ſwellings called *buboes*, we find that their appearance is always in the line of the infected lymphatic; and thus we may explain the nature of the ſwellings of which we now deſign to treat.

Any ſwelling of a lymphatic gland, wherever ſituated, is called a *bubo*; but as this, for the moſt part, ariſes from a venereal cauſe, when a bubo is ſpoken of, we commonly mean by it a *venereal* bubo. Theſe, according to the way in which the infection has been received, ariſe in the groin, or other parts of the body. When the venereal virus enters the body in the common

mon way, the bubo appears in the groin, becauſe the lymphatics of the genitals paſs through the inguinal glands; but, when it is received by the hand or fingers, as when a perſon, with any ſmall wounds in theſe parts, touches a venereal ulcer, the bubo appears in the arm-pit. Again, when the infection is caught by the lips, which often happens to nurſes, even to thoſe who do not give ſuck, from kiſſing and feeding the children they have undertaken to nurſe; in theſe the bubo always appears in the glands of the neck. But, when the diſeaſe is received by the nipple, as when a ſound nurſe ſuckles an infected child, the bubo appears in the axilla, or the fore part of the ſhoulder, in the hollow formed between the external end of the clavicle and ſhoulder.

Buboes, as we have ſaid, ariſe commonly from a venereal cauſe, and the preceding ſymptoms are either gonorrhœa or chancre. Sometimes, however, the bubo itſelf begins to appear without any viſible venereal affection appearing either on the glans, or any where elſe; but at whatever time, or in whatever manner it makes its appearance, the bubo is always a certain ſign that the infection at that time has penetrated no farther into the ſyſtem. It is however certain that chancres are the firſt ſymptoms that precede a bubo; and I am of opinion, that, without the

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uſe of mercury, they would ſeldom or ever heal. Sometimes, indeed, it does heal, even when the bubo produced in conſequence of it does not. Chancres alſo are frequently ſtationary, while the bubo continues to advance; the gland becoming more and more inflamed and tumefied, changing its colour, and at laſt turning wholly into a painful abſceſs, frequently of a livid hue.

It is a matter of conſiderable importance, after a bubo has made its appearance, to determine whether we ought to bring it to ſuppuration or not. To do this, we muſt firſt conſider whether or not the ſwelling really does ariſe from a venereal cauſe; and, if it be in the groin, I believe we may, without heſitation, affirm that it certainly does ſo; for, though the glands of the arm-pit or neck may ſwell and become inflamed from various cauſes, yet I do not think thoſe of the groin ever do ſuppurate, except in conſequence of a venereal infection. As ſoon, therefore, as we are ſatisfied of this, we ought to confine the patient to a ſtrict regimen. All high ſeaſoned food and ſtimulating drink ought to be avoided; for, as the diſorder is truely inflammatory, it would be highly prepoſterous to act in any other manner than what is found to be proper in inflammations of a different kind. Every judicious practitioner muſt know, that, in caſes of bubo, the patient is often ſubject to

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a high degree of irritation, when ſtimulants would produce the very ſame bad effects that they would in an ardent fever. The end to be obtained here, as in every other caſe of inflammation, is to terminate the ſwelling by reſolution, and to avoid a ſuppuration if poſſible. Formerly indeed, when it was ſuppoſed, that, by means of a bubo, nature deſigned to throw off the offending matter, practitioners univerſally adviſed to bring the tumor to ſuppuration; but now, when it is known that no diminution of the diſeaſe can take place by ſuch an event, the practice is directly oppoſite, and every method is taken to reſolve any glandular ſwelling as ſoon as it appears, unleſs in ſome very particular caſes. Were every bubo of the ſame kind, and all patients of the ſame habit and conſtitution, we ſhould be able to lay down one general and certain rule, by which buboes, in all caſes, could be reſolved. But ſo great is the difference in this reſpect, that while ſome patients will perfectly recover, and their buboes be reſolved during a courſe of mercury, others cannot bear as much of that medicine as is neceſſary to cure the diſeaſe, without coming to ſuppuration; and hence it is always neceſſary for a ſurgeon to conſider well the conſtitution of his patient, before he preſcribes mercury in any conſiderable quantity. In general we find, that, in very irritable habits,

habits, buboes are much more liable to ſuppurate than in others. In irritable habits, therefore, if mercury is thrown quickly into the ſyſtem by friction, it has a never failing tendency to haſten the ſuppuration of the bubo, by augmenting the fever, and other ſymptoms of inflammation; while in people of a contrary conſtitution, the bubo is commonly reſolved, by rubbing a proper quantity of mercurial ointment into the inſide of the thigh of the oppoſite ſide. It is neceſſary, however, to obſerve, that, as the effect of mercury is by no means confined to the matter in the gland, but, as in other caſes, pervades the whole ſyſtem; and it is only in conſequence of the effect of the medicine upon the ſyſtem that the bubo is reſolved. When we endeavour then to reſolve an inflamed bubo by means of mercury, the ointment ought always to be rubbed into the thigh of the oppoſite ſide; becauſe in this way the gland cannot receive any immediate ſtimulus from the quick action of the mercury upon it.

By the uſe of mercury, the venereal virus not only in the bubo, but chancre alſo, and throughout the whole body, is commonly deſtroyed; but ſhould this happen not to be the caſe, we muſt then endeavour to procure the reſolution of the bubo by other methods. The patient being put, as already directed, upon an antiphlogiſtic

giſtic regimen, being alſo confined to his room, and enjoined to uſe as little exerciſe as poſſible, we are to apply leeches as in other caſes of inflammation, and to repeat them according to the nature and urgency of the ſymptoms. The bowels ought alſo to be kept moderately open by gentle laxatives. We ought alſo to apply ſolutions of ammonia acetata, by means of a linen cloth ſeveral times folded, and dipped in the liquor as hot as the patient can bear it. Theſe applications ought to be frequently repeated; and, if the bubo is not inflamed, he ought to rub into the leg of the oppoſite ſide a drachm of the common mercurial ointment every night before he goes to bed; which, as well as the other medicines, ought to be perſiſted in, until the bubo diſappears entirely.

In moſt caſes where buboes are treated at firſt in the manner above directed, they ſeldom come to ſuppuration; though in ſome conſtitutions, particularly where the patient is of a ſcrophulous habit, it will, for the moſt part, be impoſſible to reſolve them. Whenever it is evident, therefore, that a ſuppuration cannot by any means be prevented, we muſt inſtantly give up the farther uſe of mercury. An emollient poultice ought to be applied, if the pain is very troubleſome; and this ought to be applied twice a-day. The patient ought to enjoy a pure air,

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and to have a nutritive diet, provided his appetite is not impaired, but no very ſtimulant or putreſcent food ought to be allowed. The tumor ought alſo to remain long unopened, that as much as poſſible of the hard part, or body of the gland, may be diſſolved; and, when fully ready, it will point at the very ſpot where the inciſion ought to be made. The poultice ought to be continued for ſome time after, until the matter be entirely diſcharged, when commonly every degree of fever will be gone off. The opening of a bubo is evidently no more than the opening of a ſimple abſceſs; nor does there ſeem to be any neceſſity for the leaſt variation in the mode of operating upon either; though a modern writer on ſurgery informs us that he has opened buboes by a cord, by a number of ſmall punctures, &c. yet to what purpoſe he uſed theſe different methods does not appear.

After the fever is entirely gone off, and we are ſatisfied that a ſufficient quantity of the mercury has been thrown into the ſyſtem to conquer the venereal infection, there will be no occaſion for uſing it any more; but, if we are of a contrary opinion, we muſt again have recourſe to it, and there will now be no danger of exhibiting this medicine in proper quantity. Even while we are throwing in the mercury, inſtead

of producing any bad effect upon the ſore, we will perceive the latter begin to look well, freſh coloured, and begin to granulate from the bottom like that of any other healthy abſceſs; and, while it has this appearance, we are ſure that the mercury is performing its office properly. If this appearance continues, we muſt alſo continue to throw in mercury, until the ſore is quite healed; but the moment we obſerve the progreſs of the cure ſtopped, and that the ſore begins to look worſe, we muſt then ſtop the mercurial courſe, dreſſing the ſore in the mildeſt and lighteſt manner, and putting the patient on a nouriſhing diet, and changing the air if poſſible. If, inſtead of this, we perſiſt in the uſe of mercury, the ſore will be changed into an ill conditioned ulcer with hard and livid edges; diſcharging, inſtead of laudable pus, a thin fetid ſanies, and, in ſhort, putting on a cancerous appearance. Topical applications are here of no uſe; neither will cicuta, hyoſcianius, or any of thoſe remedies found efficacious in ſcrophulous, or cancerous caſes, be of the leaſt value here, for the diſeaſe is not ſcrophula, nor cancer, but too great a quantity of mercury thrown into the body; and, if the tone of the ſtomach be not totally deſtroyed, and the patient's ſtrength entirely exhauſted, he will ſoon recover, if proper

diet and medicines are allowed, with a change of air, as has been already mentioned. His diet ought to be chiefly milk, in all its different forms, viz. a wine biſcuit broken into ſmall pieces, and the milk brought juſt to the boiling point, and poured upon it, ſweetening the whole with a little ſugar. When this kind of diet ceaſes to be agreeable, he may uſe rice and milk with mace and cinnamon; or he may uſe ſago boiled in milk, and every day at dinner he may be allowed ſome good ſoup, and ſome light and eaſily digeſted animal food, or fowl, with the uſe of the cluniluvium every ſecond or third day. The only internal remedies that can be depended upon are the Peruvian bark, given in doſes of half a drachm three or four times a-day; and, if the ulcer is very painful, the pain muſt be abated by means of opium, a medicine, in caſes of this kind, attended with the moſt ſalutary effects; but, as ſoon as the pain has ſubſided, and the ſore begins to look well, the uſe of the medicine is to be gradually diminiſhed, until at laſt it is totally given up. While it continues neceſſary, however, it muſt be exhibited in large quantities. In many caſes I have found it neceſſary to give a ſcruple in twenty-four hours, in order to relieve the pain. But, where the ſore has put on the cancerous appearance, and is attended with the bad ſymptoms already mentioned, the carrot poultice ought to be applied as in real cancers, changing

changing it twice a-day, in order to correct the intolerable fetor with which fores of this kind are always attended. Conſiderable advantage may alſo be derived, from applying a piece of caddice of the ſize of the ſore dipped in tincture of myrrh, applying over the whole a large poultice of oat meal and yeaſt. As ſoon as an appearance of healing, with healthy granulations, is perceived, the ſore muſt be dreſſed with the mildeſt ointment, putting over the whole a ſmall cuſhion of tow, with a flannel bandage above all to ſupport the dreſſings, and keep up a proper preſſure upon the ſore, and parts adjacent, by which means we will have the happineſs to find the ſore put on a healthy appearance, and the patient will in a ſhort time be cured.

On the whole we may conclude, that the bad condition of all the buboes, which come to ſuppuration, can only ariſe from one of the two following cauſes, viz. 1. From miſconduct on the part of the patient by too high living, which brings on ſuch a ſtate as I would call inflammatory. 2. From a degree of inflammation ariſing from the irritation of the bubo itſelf; and, 3. From too great a quantity of mercury being thrown into the ſyſtem. In the firſt caſe, it would be highly improper to attempt the diſſolution of the bubo by mercury, while the inflammatory ſymptoms remained; becauſe, after a certain quantity of this medicine has been thrown into

into the body, it will produce ſymptoms of the ſame kind with thoſe which the patient has already brought upon himſelf by his irregularities, and thus make matters worſe than they were. In ſuch circumſtances the uſe of mercury muſt be entirely laid aſide, and the patient put upon a low diet, until the threatening ſymptoms abate; and this general rule will be found to hold good in all caſes where inflammatory ſymptoms occur, from whatever cauſe they muſt ariſe. But, after the bubo has come to ſuppuration, the ſore begun to look well, and granulations to ſpring up, we may be aſſured that it never will put on the appearance of a foul cancerous ulcer, but by an exceſs in the quantity of mercury, or from the irregularity of the patient during its uſe; and then it is impoſſible to accompliſh a cure by any other means than thoſe already mentioned. As the ſubject I am now treating upon, however, belongs properly to a treatiſe which conſiders more particularly the venereal diſeaſe in all its ſtages, I would recommend it to every young ſurgeon to peruſe Mr Foot's Treatiſe on Origin, Theory. and Cure, o the Lues Venerea, where they will find the diſeaſe in all its varieties treated of in a maſterly manner, indeed, in my opinion, ſuperior to any that have yet written on the ſubject.

SECT.

## SECTION VII.

### *OF LUMBAR ABSCESSES.*

THE name of lumbar abſceſs is commonly given to thoſe ſuppurations which take place in the cellular ſubſtance lying on the ſurface of the pſoas muſcle. They are always dangerous, very often prove fatal; and, in order to leave a proper notion of the ſeat and nature of the diſeaſe, it will be proper to conſider a little the anatomy of the parts, more eſpecially as practical writers have fallen into conſiderable miſtakes, from not properly attending to this ſubject.

The pſoas muſcle ariſes from the inferior vertebra, and their proceſſes of the back and loins by ſo many heads, and thoſe ſo concealed by the thick fleſhy parts of it which cover ſome of them, that the beſt anatomiſts have found it a matter of great difficulty to enumerate them all. The muſcle remains thick and ſtrong, until it reaches the internal iliac which it joins, and then paſſes out below Poupart's ligament. There the two tendons join together, and from thence they turn obliquely inwards with a curvature, to be inſerted

inſerted into the leſſer trochanter. From the ſymptoms that precede the formation of an abſceſs in theſe parts, as well as thoſe that follow, we certainly know that the ſuppuration takes place in the cellular ſubſtance diſperſed all over and around the fleſhy parts and heads of the muſcle; and, when the matter is formed, it then paſſes down, either behind the body of the muſcle itſelf, or ſometimes before it, until it comes to the junction of the pſoas with the iliacus internus. Then it deſcends ſtill farther, ſometimes on the inſide, and ſometimes on the outſide of theſe muſcles, till it comes to Poupart's ligament, where it makes its appearance externally in a ſmall external tumor, ſeated in that very place where the femoral hernia is obſerved. Hence, as it is evident that the muſcles always lie behind the peritonæum, it muſt always be between the matter of the abſceſs and the bowels; and, of conſequence, that it ſeldom or never can burſt into the cavity of the abdomen; whence alſo it cannot, as ſome chirurgical writers have imagined, paſs down the pelvis, and occaſion any tumor in the neighbourhood of the anus. When any ſuch tumor is obſerved in caſes of lumbar abſceſs, the matter muſt have inſinuated itſelf below the glutæi muſcles of the haunch joint, near the acetabulum, or upon the back part of the os ilium, immediately above the junction with the iſchium; whence,

whence, paſſing down on the outſide, and penetrating between the rectum and levator ani, and appearing in a tumor at the verge of the anus, or perhaps it may penetrate the rectum itſelf in the back, and paſs off by ſtool. There are likewiſe inſtances where the matter, inſtead of paſſing down in the manner juſt mentioned, has made its way through the back, and pointed in the middle ſpace between the top of the ilium, and undermoſt vertebræ of the back; and, in this caſe, it has generally been miſtaken for an abſceſs or ulcer in the kidneys. But, from this, it may always be very eaſily diſtinguiſhed, becauſe in every abſceſs of the kidney the matter muſt of neceſſity be mixed with the urine, and either paſſes off in great quantities by the ureters, or, if it points through the external integuments, ſtill the ſituation is diſcoverable, by the urinous ſmell of the matter diſcharged from the opening. There is alſo inſtances of its having penetrated the colon, and been diſcharged by ſtool.

If there is not a free diſcharge of matter from the lumbar region, as ſoon as an opening is formed on the top of the thigh, it muſt be evident, that, from the great quantity of cellular membrane now in a ſtate of ſuppuration, and the little reſiſtance made by the reſt, the matter may inſinuate itſelf among the muſcles in a great variety of ways, and at laſt pervade the whole thigh. In this caſe it will occaſion inflammations

tions and ſwellings in many places, penetrating outwards, and forming openings which diſcharge very copiouſly. In one patient affected in this way, I found no fewer than ſix holes in the thigh, all of which broke out after the ſwelling in the groin had been opened. There never can be any danger of an attentive ſurgeon miſtaking this diſeaſe for a femoral hernia; for, by laying the patient upon his back in an horizontal poſture, the ſurgeon will find, that, by preſſing the under part of the tumor, the matter will be puſhed back; and, if the other hand be placed on the ſame ſide of the abdomen, immediately in the hollow of the ſide under the ribs, and there preſſing firmly and quickly, the matter will in general ſtrike the hand with ſome degree of force, and an undulating ſenſation will be felt by the upper hand, or an undulation of the ſame kind will be felt in the groin, if the patient coughs, and by either of theſe the exiſtence of the abſceſs is demonſtrated; or, though none of theſe ſigns ſhould be very evident, we cannot fail to diſcover it by the total abſence of every ſymptom of hernia; but, as theſe ſymptoms have been already enumerated under the head of hernia, I muſt therefore beg leave to refer my readers to that part of the work. There is only one ſymptom in which the femoral hernia, and lumbar abſceſs, agree, viz. that in both there is

a ſoft inelaſtic ſwelling at the top of the thigh. In every other they totally differ.

Abſceſſes of the pſoas muſcle commonly ariſe from exceſſive fatigue in walking, and then expoſing the back to the cold, while the body is ſtill warm with the exerciſe. They may alſo be brought on by ſtrains, attempting to raiſe great weights, or by twiſts, when carrying heavy loads on their backs; but, from whatever cauſe it may ariſe, the ſymptoms are always the ſame, viz. ſevere pain in the ſmall of the back, at the top of the lumbar vertebræ, daily increaſing, with fever, quick and full pulſe, attended with an uneaſy ſenſation of heat in the part, but affecting only one ſide of the ſpine; and, along with the other ſymptoms, the patient is very reſtleſs, thirſty, and weak. If no medicines are taken to prevent the progreſs of the diſeaſe, or if they prove ineffectual, the complaints continue and increaſe, until at laſt matter begins to make its appearance by a tumor in the groin; and, if the abſceſs is allowed to break of itſelf, the whole internal cavity of the large cyſt, in which the matter is contained, becomes inflamed by the acceſs of the air. This is followed, in a day or two, by a copious diſcharge of thinner and worſe coloured matter than that which iſſued at firſt; the patient becomes hectic; and the matter becoming daily more and more fetid and

corroſive, the cartilages of the vertebræ, nay the vertebræ, in a great meaſure, themſelves are deſtroyed, and the patient periſhes miſerably. On diſſecting the bodies of ſuch as have died of this diſeaſe, it is no uncommon thing to find all the lumbar vertebræ not only denuded of their ligaments and muſcular connections, but the bodies of them quite carious, the matter having penetrated almoſt to the ſpinal marrow. That theſe ſymptoms are occaſioned by the admiſſion of air into the cavity of the abſceſs, is, I think, ſo evident, that we need ſcarce ſpend time in proving it. As long as the abſceſs remains unopened, either by nature or art, the patient continues free from any inflammatory ſymptom; even the pain which at firſt was very ſevere abates remarkably, being ſcarcely felt but upon motion, by which the fibres of the pſoas muſcle are irritated, as they muſt alſo have ſuffered greatly by the ſuppuration, and conſequently be the more ſenſible to irritation of any kind.

From this hiſtory of the diſeaſe, it appears, that, as it depends originally upon inflammation, the ſurgeon ought by all means to attempt reſolving it without ſuppuration; and, for this purpoſe, he is to uſe all the means already enumerated for that purpoſe. When theſe are made uſe of in proper time, there is always great reaſon to hope that the diſeaſe will go off without

any

any bad effect remaining; but unhappily we find, that, for the moſt part, the patient has neglected to call for aſſiſtance, until the ſuppuration is not only unavoidable, but even until openings have been naturally formed in it, in which laſt caſe it may be impoſſible for the art of ſurgery to be of any uſe. If, therefore, the ſurgeon happens to be called after the matter is completely formed, but before the tumor has burſt, he ought inſtantly to diſcharge it, by ſome of the methods recommended in the former part of this work, for opening of abſceſſes. This may be done by a ſeton, laying the patient on his back one third erect, and cauſing the aſſiſtant to preſs gently upon the abdomen, that the matter may be puſhed downwards in ſuch a manner as to fill up and diſtend the tumor, that ſo the cord may be the more eaſily introduced. A tranſverſe cut is firſt to be made in the ſkin and cellular ſubſtance, till we come to the faſcia. We muſt then introduce a flat trocar within the cut, which ought to be no larger than to allow it to paſs freely up under the ſkin, for at leaſt three quarters of an inch, when the hand is to be raiſed, and the trocar puſhed obliquely, and gently upwards, till the canula has completely entered the faſcia, which makes the lower part of the ſac. The trocar muſt now be withdrawn, and the matter allowed to flow out gently, ſtopping

ping it every now and then for ſome minutes. The aſſiſtant muſt now withdraw his hand to take away the preſſure, and put the thumb of his left hand upon the opening of the trocar, holding it between his fore and mid fingers. It muſt then be puſhed up to near the top of the tumor, where its opening may be diſtinctly felt by the fore finger of the right hand. As ſoon as it is thus felt, it muſt be kept firm in the ſame poſition, and the trocar is again to be introduced into it, and puſhed through the ſkin at that place where it is felt, and the canula along with it. This being done, a probe, with a cord of fine ſoft ſilk, anointed with olive oil, muſt be paſſed through the canula, which being withdrawn, the cord is left in its place. After this, it is to be cloſely ſurrounded, immediately above both openings, with a ſlip of linen ſpread with any mild adheſive ointment, the more fully to exclude the air. The ſeton is then to be dreſſed according to the directions formerly given; and, in caſes of this kind, that part of the cord which is to be drawn through the abſceſs muſt be always well moiſtened with oil olive, to allow it to paſs with all poſſible eaſe, by which means the matter will at laſt be evacuated, without any ſuch collapſe taking place as to produce any bloody diſcharge, For ſome time no diſcharge of matter takes place, except-

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ing at the time the cord is drawn; but, in two caſes, the only ones I ever had an opportunity of opening in this way, a conſiderable quantity of matter at laſt run out at the under opening. Both patients recovered, and the flux was entirely dried up in three months. Their health became much better than before, and the cord being gradually diminiſhed, until ſcarce a particle of matter was to be obſerved, it was removed. On taking it away entirely, a compreſs was laid along the courſe of the inus, and kept there, by means of a roller, until there was not the leaſt danger of any new collection being formed. It is now three years and an half ſince the firſt of theſe patients was cured, and he has never had the ſmalleſt return of the diſeaſe, though his health has been leſs perfect than might have been been imagined, conſidering that his appetite is good, and he ſleeps well, without any collignative ſweats.

A treatiſe has been publiſhed by Mr Abernethie, ſurgeon in London, in which it is recommended to open lumbar abſceſſes, by means of the trocar, as in diſcharging liquids from any of the cavities of the body. The trocar is to be puſhed in through the ſkin, and then through the faſcia; after which, the matter is to be evacuated, and the inſtrument withdrawn. The wound is then to be cloſed, and dreſſed with a little

little lint moiſtened in the tinctur. benzoes compoſita, and the part again covered with ſticking plaſter, and the whole varniſhed over with gum. In this ſituation, it is allowed to remain for ſixteen days, when matter had again collected in ſuch quantity as to render the tumor prominent. A ſecond operation is then performed, and a ſmaller quantity of bloody matter (in the proportion, he ſays, of nine ounces to three pints) was drawn off. The wound is to be treated exactly as before; and, in four weeks and five days, a third operation becomes neceſſary, and ten ounces of lymphatic matter, but rather dark coloured and turbid, was taken off. In fourteen days after, a third operation is performed, and about four ounces more of a liquid of the ſame kind drawn off; and, ſome time after, a fourth operation, by which another ſmall quantity is drawn off. In fourteen days the abſceſs is laid open, and an inciſion made in it of about an inch and half in length. This, (he ſays), was followed by an increaſe of the diſcharge and hardneſs for ſome days; the thigh remained ſtiff and ſore, and could not be moved without pain; but there was now no pain in the loins, and the ſore began to granulate, and in a little time healed up almoſt entirely. Yet he confeſſes, that, by moving a probe round on the ſurface of the wound, he could feel the faſcia

looſe,

looſe, and ſeparated from the other parts; and to remedy this he had recourſe to a ſeton. By this, he raiſed new inflammatory adheſions, by which the ſinus was at laſt obliterated, all but the tract of the ſeton itſelf; and, in order to unite the ſides of this, he was obliged to have recourſe to injections of ſpirit and water, by which the cure was at length completed.

From this account of Mr Abernethie's mode of operating, I think it very evident that the cure might, with more eaſe to the patient, have been completed, by uſing the ſeton at once, which he was at laſt obliged to make uſe of. It is impoſſible that ſo many perforations can be made agreeable to any patient; nay, he muſt undoubtedly be greatly diſheartened and diſtreſſed by them; neither can it be made to appear that they are at all neceſſary to the cure, for the ſeton is certainly abſolutely ſufficient to make a complete diſcharge of the matter originally; while, according to Mr Abernethie himſelf, it is abſolutely neceſſary at laſt to complete the cure. In ſhort, by following the method I have laid down, I think it is very evident that the patient might have been ſaved from four uſeleſs operations, and the injection might have been ſuperſeded, by a compreſs laid along the courſe of the ſeton, which would not endanger the raiſing any inflammation in the cavity, as might be

be done by injections. From every obſervation, indeed, that I have been able to make upon this terrible diſeaſe, I am of opinion that the patients never have any great complaint after the matter is formed; nor do I believe that the accumulation of it is attended with ſuch pain as might be expected. But, when the abſceſs burſts, or is artificially opened, and the whole quantity of matter is evacuated at once, a ſudden collapſe takes place, and a partial accumulation enſues in the adjacent ſmall veſſels. Hence, we may eaſily account for the bloody diſcharge which enſues on the ſecond puncture, as well as the ſubſequent inflammation of the whole cyſt, which will undoubtedly come on to the certain deſtruction of the patient, if the air is allowed to have a free acceſs to it. But of this enough has been ſaid in other parts of the work.

## SECTION VIII.

### *OF THE PARONYCHIA, OR WHITLOW.*

THIS is an inflammatory and very painful ſwelling in the laſt phalanx of one of the fingers, or from the root of the nail forwards. The true paronychia

paronychia is of two kinds: 1. That which arifes from the prick of a pin or needle, or any other external injury. It is attended with great heat, confined as it were to a fingle point, fharp pain in the fame point, with fome degree of fulnefs and fwelling about the end of the finger. All thefe fymptoms generally make a rapid progrefs, fo that the point of the finger at laft fwells very confiderably, with fevere beating pain, fhiverings, and other figns of fuppuration. On laying open the tumor after the matter has been formed, we generally find it collected between the fkin and that fubftance which furrounds the flexor tendon that bends the laft joint, beginning, as it were, upon the external furface of the periofteum, and penetrating outwards. A modern writer on furgery has, indeed, informed us that the matter here is fituated below the *mufcles* of the fingers; but anatomifts have defcribed no mufcles in this place; and, indeed, it is abfurd to think there fhould be any, as they have nothing to act upon. In fuch diffections as I have made, I never could find any thing but a fatty fubftance furrounding the tendons of the flexores profundi, which tendons are inferted about the middle of the bone. 2. The other kind attacks without any evident caufe, and comes on with much more violence

than the former. At the firſt attack the pain is more ſevere, and not only the finger, but the whole hand ſwells exceedingly; the inflammatory ſymptoms run ſo high that the patient ſometimes becomes delirious, and falls into convulſions; in which caſe it is not uncommon for tumors of a conſiderable ſize to appear in the arm-pit; and, on laying open the ſwelling in the finger, we always find the matter ſituated between the periоſteum and bone; and, if this be allowed to remain long before it is diſcharged, the whole bone of the phalanx becomes carious. Both theſe diſeaſes are of an inflammatory nature; and, therefore, the proper cure muſt conſiſt in the application of ſuch remedies as are calculated to abate inflammation, which have already been pointed out; but of all theſe there is none equally efficacious with topical blood-letting by leeches. Theſe ought to be applied on the very firſt attack of the pain, and to be repeated until it is entirely gone; and, between each application, we ought to keep the finger immerſed for ſome hours every day in a ſtrong ſolution of ſacchar ſaturni, or of ſal ammoniac, wrapping it up afterwards in cloths dipped in the ſame; and, if this method be followed from the beginning of the attack, the ſuppuration will certainly be prevented. It very often happens, however, that the ſuppuration has already taken place

place before the ſurgeon is called. This may be known by a kind of elaſtic feel in ſome part of the point of the finger, and this ſpot is always ſituated on one ſide, very near the extremity; and, as ſoon as we are thus made ſenſible of the exiſtence of matter, it ought inſtantly to be laid open with the point of a lancet, putting it in until we obſerve the matter flowing out by its ſides. Thus, we will never be in danger of wounding either the flexor or extenſor tendons, both of theſe being inſerted on the rough ſide of the bone near the joint. This will always be found a complete remedy when the matter is ſituated without the perioſteum; but, when it lies within it, we ought not to heſitate in the leaſt at introducing the point of the lancet the moment we have reaſon to believe that the ſmalleſt particle of matter is formed. We know that this is the caſe, by the exceſſive pain and ſwelling in the point of the finger ſtriking up through the whole of it, and even reaching the arm-pit, as has been already mentioned. In this caſe, the matter is always formed in the very centre of the point, near the middle of the bone, the pain being increaſed by any additional heat, and therefore is always worſe when the patient is in bed. As ſoon as theſe ſymptoms take place, we are to introduce, without the leaſt heſitation, the point of the lancet into the centre

of

of the ſpot, puſhing it in, until we feel it plainly rub upon the bone for at leaſt a quarter of an inch in length. Thus, a free vent will be given to the matter; and, by the regular application of an emollient poultice three times a-day, along with an opiate, which ought to be given ſometimes twice a-day, if the pain happens to be very ſevere; by this method, the pain, ſwelling, and inflammation, will ſoon abate; and, in a few days, the wound will heal before any caries takes place, which it will moſt certainly do, if the matter is allowed to remain for any time. If, however, we ſhould happen not to be called to the patient till eight or ten days after the diſeaſe has come on, when matter will certainly be formed, and, in all probability, the patients themſelves have attempted to let it out by puncturing the part, we muſt inſtantly introduce the lancet to the bone, in order to give vent to the matter, as in all probability the patient will not have gone deep enough to evacuate; and, if the bone of the phalanx be found carious, it muſt inſtantly be removed, which will prevent any of thoſe ſevere ſymptoms that muſt otherwiſe unavoidably take place. In caſes of this kind, where the bone is found carious for any conſiderable length, we muſt inſtantly take it away altogether, laying open the finger from one end of the diſeaſed phalanx to the other.

Thus,

Thus, the patient will be freed from the ſeverity of the pain, and will likewiſe retain, in ſome meaſure, even more than could be expected, the uſe of the joint; while, if we wait for exfoliation, we will certainly be diſappointed, and the diſeaſe, inſtead of being cured, may be attended with the loſs of the next phalanx, or even the whole finger.

When this operation is to be performed, the wound, as has already been ſaid, muſt be enlarged the whole length of the diſeaſed phalanx, when, with the point of a very ſmall round edged ſcalpel, we muſt remove any portion of ligament or tendinous matter which adheres. But, if the caries has gone to a very great length before the ſurgeon is called, the bone may be taken away at once by a pair of forceps, after having made an inciſion through the joint. The pain is, indeed, very ſevere; and therefore the ſurgeon ought to ſay nothing about it to the patient, as knowing that it will be followed by immediate eaſe. After the bone is removed, we muſt interpoſe, between the edges of the wound, a ſlip of linen ſpread with emollient ointment, to prevent the upper parts from coaleſcing before the granulations have ſprung up from the bottom. Thus, every ſpecies of paronychia may be cured, but with the loſs of the nail in almoſt all caſes. However, this is not attended with any material inconvenience, as

nature

nature never fails to ſupply another, forming a preternatural hardneſs until this is accompliſhed. I ſhall now relate an inſtance of the efficacy of the method above recommended, and which ſhows in a remarkable manner how neceſſary it is to remove the bones of the finger as ſoon as they are infected with a caries.

I. J. F. a man of fifty-four years of age, had a ſtroke with an hammer upon the very point of his firſt finger of the left hand, which was followed by extreme pain, ſwelling, and inflammation, in that joint. As the diſeaſe ſtill continued to increaſe, the ſurgeon thought proper, in twelve days after the injury was received, to amputate the laſt joint of the finger. But, on the very firſt dreſſing after this operation had been performed, the inflammation was found to have pervaded the whole finger to the metacarpal bone, and an opening had taken place on the ſecond phalanx, the whole of the teguments mortified, and, in three weeks after, ſloughed off completely, leaving the bone quite bare, ſo that it became neceſſary to remove it. But, upon taking off the bone of the laſt phalanx, it was found that the diſeaſe had invaded the metacarpal bone alſo; though, as the affection was but ſlight, it was hoped, that, by care and attention, the bone might be ſaved. But, inſtead of this, the pain, inflammation, and other

other bad ſymptoms, continued to increaſe; the whole integuments, with which the metacarpal bone was covered, became inflammed, thickened, and of a livid colour, as far as the articulation with the bones of the wriſt; beſides which, a ſinus runs down between the integuments and bone for about two inches and an half, which was alſo laid open, in order to allow the bone to exfoliate; another opening being made in the inſide of the hand to allow of a free diſcharge of matter. In about four weeks after, during which time the ſore had become worſe and worſe, the patient was put under my care. I found the metacarpal bone carious, and enlarged, and ſuch a ſevere ſwelling, pain, and redneſs, over the whole hand, that there was great reaſon to fear an amputation of the whole would be neceſſary, unleſs this bone could be taken away. The patient having willingly conſented to any thing which had a chance of ſaving his hand, the operation was performed in the following manner. Having ſeated him on a chair, the fore arm and hand were laid upon a thin pillow upon a table, and an inciſion made from the wriſt joint, immediately from the articulation with the bones of the wriſt, along the whole courſe of the bone. The ſkin, cellular ſubſtance, &c. were then diſſected with the greateſt care, from both ſides of the bone, throughout

throughout the whole length of it; and the bone being thus freed from every adhering ſcore, whether muſcular or tendinous, I opened the capſula of the joint with a ſharp lancet pointed ſcalpel; but, in doing this, though the utmoſt care was uſed, I could not avoid dividing the arterial arch which is formed by the junction of the ulner, radial, and interoſſeous arteries. I inſtantly took up one end of this with the tenaculum; but finding it impoſſible to take up the other, either with the tenaculum or needle, on account of its being ſo far retracted, I applied ſeveral pieces of agaric, filling the wound at this part with folded pieces of caddice riſing a little above the ſurface of the wound. All along the other parts of the wound its ſides were brought together, and pieces of linen, ſpread with emollient ointment, put over the top of it, with ſome dry pledgets above all, and the dreſſings kept on by a roller put pretty hard round the hand, in order to compreſs the artery, and prevent any hæmorrhage. By means of an anodyne draught, with forty drops of laudanum, he had a good night's reſt, but, next morning, complained very much of pain in his hand from the tightneſs of the bandage. This being cut almoſt quite through, he got conſiderable eaſe; however, as the pain ſtill continued ſevere, I ordered the whole hand, dreſſings and all, to be

immerſed in a ſolution of ſugar of lead, three times a-day, for upwards of an hour at a time. By this, and the uſe of an anodyne, the pain abated; and, on the fourth day, when the wound was looked at, almoſt one half of it appeared to be united. That part of the dreſſings, however, which was next the wriſt, was not meddled with, for fear of renewing the hæmorrhagy. The hand was then dreſſed as before, and the fomentations renewed; but, as the patient was now greatly weakened by the exceſſive diſcharge, and the many operations he had undergone, it was judged proper to allow him a more nouriſhing diet than formerly, with a few glaſſes of wine daily. In ten days from the operation, all the dreſſings were thrown out of the wound, which now looked well; and the ſides of it were brought exactly together, and ſecured in that poſture, by a flannel roller. In twenty-two days from the operation it was completely healed; and it has continued ſo for two years, during which he has worked at his buſineſs of an edge-tool maker as before. The hand is repreſented, both in a ſtate of pronation and ſupination, Pl. 1. Fig. 4. and 5.

In this caſe, it is evident that it was of the greateſt uſe to the patient to heal the greater part of the wound by the firſt intention; alſo to alleviate the inflammation, by immerſing the

hand in the warm ſolution of lead, and to mitigate the pain by opiates. In three other caſes, nearly ſimilar, I ſaved the hand; in one, by removing the metacarpal bone of the middle finger, and in the other two thoſe of the fore fingers. In the firſt of theſe patients, the loſs ſeemed to be ſupplied by a bony ſubſtance; and the patient was able, as ſoon as the wound was healed, to uſe his hand very completely, even in writing, which he thought he never could have done. He holds the pen with the fore and ring fingers, inſtead of the fore and middle fingers.

Beſides the two ſpecies of paronychia I have deſcribed, there is a kind of veſication which reſembles it. This takes place about the roots or ſides of the nail, and is attended with a burning heat and pain, with conſiderable inflammation of the ſkin all round. It generally begins in a very ſmall point, without any known cauſe, but increaſes as the inflammation does, and is of a livid colour, like thoſe ſmall veſications which ariſe after ſharp contuſions. The effuſion is commonly attended with no great pain at firſt; the patient being ſenſible only of a little heat, which is obſerved for about twenty-four hours before the effuſion takes place. However, after this once begins, all the ſymptoms increaſe rapidly. The cure is to allow the matter to run off freely, by puſhing in the point of a lancet into the baſe

of

of the tumor, with the flat ſide toward the finger. Thus, an opening is made ſufficient to evacuate the ſerum, while, at the ſame time, the air is excluded. We muſt then apply cloths, dipped in vinegar, regularly to the part for ſome time, and thus the troubleſome ſymptoms will always be relieved in a ſhort time.

## SECTION IX.

### *OF CHILBLAINS.*

THESE are the conſequence of exceſſive cold applied to the extremities, more eſpecially if the part affected with cold has been too ſuddenly afterwards expoſed to heat. They are moſt common in the heels, but ſometimes take place in the fingers, toes, arms, hands, or feet, or even the tips of the noſe and ears. They are inflammatory tumors, attended with heat, redneſs, ſhooting pains, and great itching, and in ſome habits the limbs ſwell conſiderably when affected with this diſeaſe, and the ſkin burſts in ſeveral parts of them, diſcharging a thin fetid matter. Theſe ſymptoms particularly take place in the heels, the integuments of which are apt to mortify

tify and ſlough off, leaving always very ill conditioned ulcers behind. Before theſe make their appearance, the parts generally aſſume a livid colour, and are covered with large veſicles like thoſe produced by burning.

Chilblains ſeem to be occaſioned by the application of too great a degree of cold to thoſe parts of the body where the circulation is moſt languid; and hence the ſymptoms muſt differ very materially, according to the nature of the part affected, as well as the ſtrength of the patient, and the degree of cold applied. Children, or thoſe below puberty, are moſt ſubject to chilblains, as well from the laxity of their fibres, as from their being more frequently expoſed to thoſe cauſes which produce them; and thoſe who have once been ſubject to ſuch complaints are always liable, unleſs the greateſt care be taken, by keeping the parts dry and warm, to have them again. At times, however, when the extremities have been expoſed to long and ſevere cold, it will be impoſſible, by any care or attention, to prevent the diſeaſe. As ſoon, therefore, as any ſign of it is perceived, if any ſnow is to be had, the parts ought to be well rubbed within a room without a fire; or, if ſnow cannot be got, we muſt take ice, or the coldeſt water we can find, into which the parts are to be plunged for a few minutes, and then gently, but perfectly dried, after being taken

taken out of the water. Theſe remedies will, for the moſt part, prove ſucceſsful in preventing the diſeaſe from making its appearance; but, ſhould it happen otherwiſe, or the chilblains have appeared before the ſurgeon is called, we may apply, with great ſucceſs, a ſolution of one ounce of ſal ammoniac in four of diſtilled vinegar. Rubbing the parts with oil of turpentine, or camphorated oil is alſo of uſe, as well as ſolution of ſugar of lead, or keeping the parts conſtantly moiſt with ſpiritus mindereri. But it muſt be remarked, that, unleſs the patient can be perſuaded to keep the parts affected dry and warm during froſty weather, almoſt no application that can be uſed will be of any ſervice. As the complaints ſeem always to ariſe from ſome defect of circulation, or laxity of fibres, general tonics promiſe to be of ſervice as a preventative. The ſea or ſhower bath are very efficacious in this way; and, if theſe be begun about the middle of September, and perſevered in for ſeveral weeks, there will be much leſs danger of chilblains during the enſuing ſeaſon than if no ſuch thing had been uſed. But, in caſe of ulcerations, which are common in young people who generally neglect the diſeaſe, we muſt avoid either emollient ointments, or emollient poultices, for both theſe have a tendency to promote the growth of fungous fleſh, with which

which theſe ulcers are conſtantly overrun. Inſtead of this, the whole ſurface of the ulcer muſt be deſtroyed by lunar cauſtic; and, after the eſchar has ſloughed off, we muſt dreſs the ſore in the moſt ſimple manner. If the cauſtic has reached as deep as to deſtroy the whole of the diſeaſed ſkin down to the cellular ſubſtance, there will be no danger of the parts being afterwards affected in this manner.

Chilblains are frequent in the north of Scotland among the country people, whoſe heels they generally affect. They appear in fungous ulcerations; and it is a very common remedy to deſtroy the fungous fleſh at once by a hot iron, which effectually removes the complaint for that time, and it never afterwards returns in that place. I have ſeen hundreds cured in this way, without a ſingle inſtance of its miſgiving. In ſome parts they apply alum beat up with the white of an egg, and put on a pledget of tow, which alſo proves for the moſt part ſucceſsful.

SECT.

## SECTION X.

### *OF SPRAINS AND CONTUSIONS.*

UNDER the head of Luxations, I have already taken notice of thoſe ſprains, called partial luxations, where the bones are partly ſeparated from one another. Here we are to conſider more particularly the injury done to the ſoft parts, and the inflammatory tumors which take place in conſequence of theſe injuries. Contuſions of the muſcles are likewiſe attended with pain, ſwelling, and inflammation; but theſe, in general, if left to nature, would not be attended with any material injury, or even deformity; but with ſprains of the joints it is otherwiſe. The pain, ſwelling, and inflammation, attending them is generally much higher than in contuſions; and they not unfrequently end in total loſs of motion in the joint for many weeks, nay, even for life, if the ſurgeon has not taken proper care. This will principally take place in ſcrophulous habits; and, indeed, I will venture to affirm, that, in by far the greateſt number of caſes of white ſwelling which happen after twenty-five years of age, the cauſe has been from a ſcrophulous habit; and hence

hence we ſee how neceſſary it is, both for a ſurgeon's reputation, and the conſcientious diſcharge of his duty, to make himſelf acquainted with the patient's conſtitution, and the proper mode of treatment in every caſe of ſprains. The following circumſtances chiefly require our attention: 1. The proper poſition of the limb in a caſe of violent ſprain. 2. The beſt method of preventing the ſudden ſwelling which is apt to ſeize upon ſuch joints as are violently ſprained. 3. The beſt method of removing the ſevere pain, inflammation, &c. when once they have taken place; and, 4. How we can recover the ſtrength of the joint.

In the treatment of ſprains, it is the firſt buſineſs of a ſurgeon to examine whether the joint has received any other injury, or if there is reaſon to believe that the ligaments have only been ſtretched in ſuch a violent manner as to lacerate ſome of the blood-veſſels, and deſtroy the tone of the abſorbents, and thus render them paralytic, and incapable of executing their office for a time. If any of the bones of the joint are found to be diſplaced, they muſt be reduced, according to the methods already laid down; after which, the joint is inſtantly to be immerſed in a veſſel of water as hot as the patient can bear it, the heat always under 112° of Fahrenheit, by which means ſuch a relaxation will take place in the

veſſels of the parts immerſed, as will allow the quantity of effuſed or ſtagnating fluid to paſs on almoſt as freely as before; and that, whether it be blood or any other, the vis a tergo being ſtill ſufficient for that purpoſe, even though the veſſels through which they paſs have been much injured. In this way, I knew, from repeated experience, that the ſudden and very great ſwelling and tenſion which take place immediately after the injury is almoſt completely prevented. After the limb has thus been immerſed for a ſufficient time in the water, a number of leeches, in an adult, who has received a violent ſtrain, not leſs than two dozen ought to be applied; the limb of the patient being placed on a ſoft pillow, glazed with oil cloth, to prevent the the blood or moiſture from ſpoiling the pillow. After the leeches have dropped off, unleſs the pain of the diſeaſed limb be very great, it ought again to be immerſed in warm water of the ſame heat as before, by which the bloodiug will be promoted; and ſometimes, in caſes of violent ſprains, it is of ſervice to take away a very great quantity. The bleeding being ſtopped, we muſt place the limb again upon the pillow in the moſt eaſy poſture we can; the patient is to have an opiate, and the joint ſhould be fully covered with ſeveral folds of flannel, moiſtened with a ſtrong ſolution of lead, ſuch as is deſcrib-

ed under the head of inflammation. But, if the inflammation and pain ſhould not decreaſe in twelve hours, or ſhould increaſe within that period, we ought inſtantly to apply the leeches and warm moiſt cloths exactly in the ſame manner as before.

In very violent ſprains of the wriſt, it will be found of great ſervice to ſupport the arm and hand by a ſplint, reaching from the point of the finger to the elbow, and of ſufficient breadth to cover the under half of the arm. Another of equal breadth ought to be applied to the outſide, paſſing over the wriſt to the middle of the metarcapal bones. The ſplints ought to be well moiſtened in the ſolution of ſugar of lead, and ought to be kept firm in their places, by means of a flannel roller put round the arm; and all the dreſſings, as well as the arm itſelf, ought to be kept conſtantly moiſt with the ſolution. If ſtill the patient be not relieved in eighteen or twenty hours, we muſt not heſitate at applying the leeches a third time, as well as the other medicines perſevered in, until he recovers. If he is plethoric, he ought to be freely purged every ſecond day, and to have his draught every night at bed-time; and I will venture to affirm, that, if ſuch a courſe be perſevered in for three days, the patient will not have any complaint in the affected joint on the

the morning of the fourth. By the uſe of the volatile camphorated liniment, and chaffing the limb well with it three times a-day, every degree of ſwelling which might remain after the pain is gone will rapidly decreaſe, until, in the courſe of three weeks at moſt, no degree of ſtiffneſs, pain, or ſwelling, will remain; the only complaint will now be weakneſs, which a ſhort time will alſo remove.

In the ordinary method of treating ſprains, we are not to expect the ſame ſucceſs. In this, the ſtrained parts are treated firſt with aſtringents, and then with emollients and unctuous applications, as if the ſurgeon deſigned, by one application, to counteract the effect of another. The aſtringents made uſe of are ſugar of lead, lees of port wine, ardent ſpirits, acids, and cold water; and, by ſuch a prepoſterous mode of proceeding, the patient may ſometimes be ſix, nine, or twelve months, before he recovers; or, if he happen to be of a ſcrophulous habit, it is well if he get off with a ſtiff joint. But, if the method I have recommended be followed, there will never be the ſmalleſt danger of ſtiffneſs or thickneſs; and, after every ſymptom of pain, inflammation, and ſwelling, is gone, and nothing but weakneſs remains, this may, in a great meaſure, be cured, by cold bathing of the part affected. The water may be conveniently applied from the

the ſpout of a teakettle, increaſing every day the height from whence it is let fall; and, after each bathing, the part muſt be rolled up with a narrow flannel bandage applied all round the joint, beginning to roll from below upwards, and making the preſſure always equal. The efficacy of this mode of treatment I ſhall now illuſtrate by ſeveral caſes.

II. Mr A. L. had the misfortune to be thrown over his horſe's head, by a fall of the animal forward in a very dark night. The gentleman pitched on both his hands; and, as both joints happened to be in a looſe or inactive ſtate, a violent ſprain was received in each, which never can happen but when they are in ſuch a ſtate. A ſurgeon was ſent for as ſoon as he came home, who ordered the affected joints to be wrapped up in vinegar cloths. Next day, being in great agony, he ſent for me. I found both his wriſt joints much ſwelled and inflamed, with intenſe heat, but the right more ſo than the left. The pain was ſo exceſſive, that, on every attempt to move the joints, he was ready to faint, although by no means of a cowardly diſpoſition. I ordered four dozen of leeches to be procured, twenty-ſix of which were inſtantly applied on the wriſt, back of the hand, and under part of the fore arm of the right hand, the others

others being applied in like manner on the left. After the leeches fell off, his hands were immerſed in two large baſons of water properly heated; and ſo great was the efficacy of this method of treatment, that they had not been ſix minutes in the water, when the patient exclaimed, in tranſport, that he was *in heaven*, in compariſon with what he felt before. Both arms bled very copiouſly, particularly the right, which not only bled for many hours in the water, but continued to do ſo for a long time after it was taken out. Both arms were then rolled up with flannel cloths, moiſtened in a warm ſolution of ſugar of lead, by which means the diſcharge of blood was continued throughout the night. He ſlept well, having got an anodyne draught, with thirty-two drops of laudanum, at bed-time; and, when I called on him next morning, he told me he had little or no pain. On removing the cloths, and bathing his arms as before, I obſerved that both the ſwelling and inflammation were much abated. What pain he now felt was chiefly in the under part of the wriſt, for which I ordered twenty-four more leeches to be applied to the right wriſt, and twelve to the left, which again procured a copious diſcharge of blood. At night, he had his draught as before, and next morning four ſcruples of compound powder of jalap. The purgative operated freely, and

and gave great relief. By the uſe of the ſaturnine ſolution and opiate, he was ſo well next day, that he ſaid he would attempt to write a little, having much of that buſineſs to do; but, as I ſaw that he moved his wriſts with pain, though he would not allow me to ſay ſo, I adviſed the application of twenty-four more leeches, twelve at the junction of the wriſt with the radius, and as many at its junction with the ulna. The hands were again immerſed in warm water for upwards of ſix hours, with a proportionable good effect. In ſeven days from the accident I found him writing with much eaſe, the pain almoſt entirely gone, except on motion, and even that plainly owing to mere weakneſs, which was effectually cured, by rubbing with camphorated oil; and, from the eighth day after the accident, he continued to carry on his buſineſs as uſual.

III. Mrs N—, a lady of about ſixty years of age, attempting to take ſomething from a cupboard, fell from the chair on which ſhe ſtood, and, in the fall, ſprained her wriſt very much. I was not called until the ſeventh day after the accident; when, upon examining the hand and wriſt, I found a ſwelling extending from the points of the fingers all over the palm and back of the hand, wriſt, and arm, to the elbow joint, with

with extreme pain, and redneſs, or rather livid colour, of the parts. The arm had been laid upon a pillow by her ſide; but ſhe told me that the pain was ſo violent, that ſhe had never yet ſhut her eyes ſince the accident, or been able to lay her head down lower than half erect. She had followed the advice of a very reſpectable phyſician; but, after all the ordinary lotions, and other things uſually recommended, had been tried in vain, ſhe had, for twelve hours, been trying the oppodeldoc liniment, and inſiſted on having a ſurgeon called. Happening to be mentioned, I attended, and, on my firſt appearance, was told that the doctor would call inſtantly. On viewing the arm, I feared that the ſwelling would not be eaſily reſolved, and that, as matters ſtood, there was danger of a gangrene; for the parts affected were of a livid colour, with yellow ſpots of a large ſize, the colour of which, I underſtood, had been heightened by the application of the oppodeldoc. On converſing with the phyſician, he told me, that, as he had long given over every attempt to act the ſurgeon, I muſt therefore treat the patient in my own way, and he would always call along with me, once a day, to chear the heart of his old and long acquaintance under her deep diſtreſs. Being thus left at liberty, I began to conſider the caſe more fully, and recollected that the appearances, which

which I had taken for indications of an approaching gangrene, were no more than what might be ſuppoſed to ariſe from violent muſcular contuſion, when abſorption begins to take place. For this reaſon, I did not heſitate to propoſe the application of leeches, as the urgency of the caſe and particular ſymptoms ſeemed to require. The doctor cordially acquieſced in my opinion, and readily agreed to meet me in the evening to ſee the iſſue. Forty-five leeches were placed on the arm in various parts, as ſeemed to be neceſſary, about eleven o'clock the ſame day; and, as ſoon as they were taken off, the hand and arm were put into warm water from twelve to three in the afternoon. At this time I called upon her, and found that ſhe complained a little of ſickneſs and faintneſs from the great loſs of blood. This was removed by a glaſs of wine; and the patient immediately expreſſed the pleaſure ſhe felt at being ſo much relieved from the diſtreſs ſhe had been in, and which ſhe compared to having her hand in a burning oven, expreſſing her gratitude to me for being the author of ſo much eaſe to her. Her hand and arm were wrapped up in flannel, moiſtened with ſolution of ſugar of lead; ſhe had an opiate, and a large domeſtic injection. This treatment ſucceeded ſo well, that the phyſician ſeemed little leſs aſtoniſhed than the pa-

tient herſelf; and, in a day or two, ſhe had no complaints of pain, unleſs when ſhe moved the joint, the under part of which was ſtill ſtiff and ſwelled. Half the number of leeches were again applied, and ſhe had a laxative electuary. The leeches diſcharged very copiouſly, the arm being immerſed in warm water for two hours after they fell off. Next morning, the ſwelling was much more abated than I myſelf could have believed; and the facility with which ſhe moved her arm was likewiſe ſurpriſing. The bathing in warm water was repeated this day for two hours, and the ſame courſe was kept up for ten days more. At the end of fifteen days from the firſt time I ſaw her, the pain and ſwelling were almoſt entirely gone; and ſhe could freely bend and extend her hand, but could not perform the motions of pronation or ſupination, owing to a ſwelling which ſtill remained, and which ſeemed to ariſe from a ſeparation of the radius from the ulna. A dozen of leeches were again applied, which, as uſual, produced a great diſcharge; and, after the bleeding was quite ſtopped, I endeavoured to bring the bones nearer to each other, by means of a flannel roller wrapped pretty tight round the arm. This bandage was every day removed, and the arm well rubbed with volatile camphorated liniment. In twenty-four days from the time I firſt ſaw her,

ſhe was quite recovered; and, on being aſked by the phyſician, Whether the leeches or warm-bathing were the moſt effectual? ſhe replied, That the leeches produced the moſt ſenſible effect, by inſtantly relieving the pain, while the warm-bath operated like a charm in allaying the burning heat and violent tenſion which had given her ſuch torment.

IV. Mr A. J. a gentleman of fifty-ſix years of age, fell into a deep pit, by which he ſtrained his left wriſt. I was called a few hours after the accident, and found the hand, wriſt, and arm, extremely ſwelled, with inflammation, heat, and redneſs, all over, and a violent burning pain. Having no leeches at hand, I immerſed the hand and joint in warm water, and deſired it to remain until I ſhould go into town and ſend out a number of leeches, which were to be applied as ſoon as poſſible. It was upwards of four hours before this could be done, and by that time the pain, heat, and tenſion, were greatly abated, ſo that he refuſed to allow the leeches to be applied, and they were accordingly brought back. As he had poſitively refuſed to follow my advice, I determined not to concern myſelf any farther, and heard no more of him for two days. Early on the morning of the third day I was ſent for, by expreſs; and, on

on my arrival, found, that though the effects of the warm water had been highly agreeable for ſome time, yet, for the laſt thirty-ſix hours, it had been quite otherwiſe, and the pain had greatly increaſed as ſoon as the hand was taken out of the water, ſo that on the whole the ſwelling was conſiderably enlarged, and the other ſymptoms worſe than they had even been at firſt. My patient was now glad to ſubmit to any thing I thought proper to preſcribe. The leeches were applied, and the hand bathed in warm water for five hours, which produced the greateſt diſcharge of blood I had ever ſeen; and the relief produced by it was almoſt incredible, ſo that the patient himſelf ſaid he could not deſcribe it. He was treated in other reſpects as the two former patients, and ſoon got rid of every complaint, excepting a little ſtiffneſs, which alſo went off, by the uſe of the cold bath from the ſpout of a kettle, as already directed. This laſt remedy I found alſo very efficacious in reſtoring the ſtrength of the joint.

On theſe caſes of ſprains, as well as others which I have met with, I muſt remark, that the very great relief always found on the immerſion of the joint in warm water, ſeems to be owing to the relaxing power of it which continued to produce its effects, until the relaxed veſſels

veſſels became again diſtended with blood; after which, the effectual relief was given by the leeches, which took away the diſtending and violently ſtimulating fluid. I do not deny that the ſaturnine applications alſo act with aſtoniſhing effect; but I know from repeated experience, that, when copious topical bloodletting is perſevered in, the pain, and every dangerous ſymptom, will be relieved by the third, or, at moſt, the fourth day; and the patient will, in almoſt every caſe, recover the uſe of the limb, while the very reverſe takes place in thoſe caſes where blood-letting cannot be practiſed. I have often known patients treated in ſuch a manner, who were very thankful to be free from pain in ſix weeks, while the ſtiffneſs and ſwelling remained as long. We can place but little dependence upon one general blood-letting, or upon purging, as theſe evacuations can only weaken the habit of the body in a certain degree; and in many conſtitutions they cannot be puſhed to any length, and particularly as bleeding has a ſtrong tendency to produce dyſpeptic complaints, hypochondriac, &c. which totally deſtroy the patient's health, while I could demonſtrate the excellency of topical blood-letting by innumerable inſtances, though I think the above are ſufficient for my purpoſe. In the vaſt number of caſes, indeed, that have come under my care, there never

never was the leaſt tendency to ſuppuration, though time was allowed them ſo to do; neither did any appearance of mortification ever enſue, nor had any ever a ſtiff joint. In patients conſiderably advanced in life, however, ſo great a weakneſs has ſometimes taken place, that it could not be removed, even by the moſt powerful external applications. This commonly takes place in women of weak and delicate conſtitutions, from an over carefulneſs, and fear of feeling the leaſt pain. I have alſo met with ſome inſtances among young men who have almoſt loſt the uſe of their limbs from the ſame cauſe. The following caſe is very remarkable, as ſhowing not only the obſtinacy of theſe complaints, but the determined ſtupidity of ſome people with regard to the mode of treating themſelves under them.

A young and *learned* beau running up ſeveral pair of ſtairs in a pair of new, tight, and handſome boots, was ſuddenly arreſted in the midſt of his career by a loud ſnap, attended with violent pain, and inſtantaneous loſs of motion in the foot. Being carried home to his lodgings, the limb was properly treated by his ſurgeon, a man of great experience and ſkill in his profeſſion. The cure went on as well as could be expected; but, though not only his own ſurgeon, but all his own acquaintance, intreated him to move

move his ancle joint frequently, yet ſo much was he afraid of giving himſelf any pain, that, for nine months, he perſiſted in keeping not only the ankle, but the knee joint, in the ſame poſture in which they had been originally placed by the ſurgeon. By this time his health was quite impaired, and he was obliged to go into the country. At preſent, the point of his right great toe reaches only to a little diſtance above the internal ancle of the left leg, and both the knee and ancle joints are completely immoveable, and muſt remain ſo. He has lately applied to his ſurgeon to take off the limb immediately above the knee, that he may at leaſt have the benefit of an artificial limb, it being impoſſible for him to walk upon crutches as much as is neceſſary for the exerciſe of his profeſſion. I ſhall now give ſome examples of my method of treating the other inflammatory tumors.

V. Mr W. M. thirty-ſix years of age, had for ſix months complained of a pain in his right ſide, which had been originally brought on by hard riding, and as he alſo afterwards ſuſpected by too free living. The laſt night of his journey, which was performed in very cold blowing weather, the pain came on, but was for ſome time neglected. At the end of ſome weeks, during which time it had continued gradually

gradually to increaſe, he felt an uncommon degree of heat, which was much increaſed by lying in bed, and occupied all the ſpace from the falſe ribs down to the ilium. The pain now began to affect him upon walking for any ſpace; and, in a few weeks more, all his complaints increaſed to ſuch a degree, that he was obliged to confine himſelf to his room. On being called, and feeling the affected ſide, I diſtinctly perceived a ſwelling of an oblong ſhape deep ſeated along the tranſverſe proceſſes of the lumbar vertebræ. He complained of pain on preſſure; but there was not the leaſt fluctuation, though the ſize of the ſwelling was very conſiderable. In other reſpects, the patient was rather feveriſh and thirſty; and, from the whole of the ſymptoms that had taken place, I was apt to conclude that they would end in an abſceſs of the lumbar kind; but, as no ſuppuration had yet taken place, I hoped, that, by proper remedies, the tumor might ſtill be reſolved. But, though I applied, at five different times, twenty leeches to the affected ſide, promoting the diſcharge by cupping glaſſes, neither theſe, nor the frequent application of bliſters, as well as the free uſe of neutral ſalts, nor any other remedy I could think of, produced the ſmalleſt good effect. The pain, ſwelling, and fever increaſed, his pulſe beating frequently from 129 to 136 ſtrokes in a minute. He began now

now to have cold and ſhivering fits regularly every morning and evening. The tumor now appeared above the ſkin, and finding it now impoſſible to reſolve it, I applied an emollient poultice over the whole; and, as ſoon as matter was perceived in it, I propoſed to the phyſician to evacuate it, by means of a ſeton introduced through the whole length of the tumor. This being approved of, the operation was performed in the uſual manner, and a great diſcharge of pus, mixed with ſomething like ſerum, took place; inſomuch, that, in two hours, the dreſſings were quite drenched with it. He had a large anodyne draught, and was now allowed half a glaſs of port in his breadberry twice a-day. He found himſelf greatly relieved by the firſt diſcharge; and the matter continued to flow in ſuch abundance, that it was neceſſary to renew the dreſſings twice a-day for the firſt eight days. By degrees, however, the diſcharge began to diminiſh; his ſtrength, which had been exceedingly exhauſted, to return; his appetite to recover, and his fever to abate. In proportion to the appearance of theſe favourable ſymptoms, he was allowed a more generous diet, and the bark and elixir of vitriol were preſcribed for him. In ſix weeks he was ſo well, that the cord of the ſeton was reduced to one half of its original ſize, the diſcharge

being almoſt gone; and, in four weeks more, it was totally dried up, every degree of pain, ſwelling, and hardneſs, being totally removed.

VI. Mr W. D. had, for many months, an abſceſs of the ſame kind. When I firſt ſaw him, he had a large opening on the left ſide of the ſpine, immediately below the edge of the undermoſt falſe rib, where it is joined to the back bone. The complaint had been brought on by great fatigue, watching, and cold; and the abſceſs had occupied all the ſpace between the ilium and ribs on the left ſide. He had, from the very firſt attack of the diſeaſe, conſulted the moſt eminent phyſicians and ſurgeons in the place; but neither internal nor external remedies had any effect in relieving him. The abſceſs, having, as in the former caſe, pointed externally, the gentleman who attended him opened it with an abſceſs lancet, and a very great diſcharge enſued. Matter continued to iſſue forth by this orifice in conſiderable quantity, and the patient's health, which had been very much impaired, began to mend; but ſtill the diſcharge continued for no leſs a ſpace than *eighteen* months after the opening had been made. Beſides the diſcharge at this opening, a large collection was alſo formed

near the anterior part of the top of the ilium, and the whole ſkin appeared ſeparated for a conſiderable way downward. From theſe unfavourable appearances, I concluded that the parts would never coaleſce in the ſtate in which they were; and that the diſcharge would ſoon be much increaſed, by the matter inſinuating itſelf downwards and backwards over the ſmall of the back and os ſacrum; alſo, that the ligaments, by which the vertebræ are connected with each other, would ſoon become diſeaſed, and thus the vertebræ themſelves might become carious. To avoid this, I propoſed to introduce a ſeton, by which not only vent would be given to the matter at preſent, but a new inflammation would be brought on, by which the parts might be diſpoſed to adhere. This was agreed to; and the effect was ſo good, that, in a day or two, he was able to walk about, and the diſcharge became much ſmaller than before, and his health by degrees to amend. In proportion to this, the quality of the matter alſo became better; and, from being thin, pale, and fetid, it became thick, yellow, and better ſmelled; and, in ſix weeks from the introduction of the ſeton, the parts appeared to coaleſce and become firm. The cord was now conſiderably reduced in ſize; but, conſidering the great length of time

time that the diſeaſe had continued, it was judged improper to remove it altogether; and, therefore, after ſome farther reduction, he went to the country with a reſolution to allow it to remain, if his health ſhould continue in the ſame way.

VII. J. M. a man of forty-ſeven years of age, happened to ſprain his haunch joint in lifting a heavy weight. This was followed by pain and tumor, which confined him to his bed, which had continued for ſix months before I ſaw him. A large puffy ſwelling now appeared on the right os ilium, which, I was aſſured, contained not only matter, but a quantity of air, though I found it impoſſible to convince either the phyſician or ſurgeon who attended him of this. The patient was very much reduced, and had already taken almoſt every remedy, preſcribed by modern practitioners, without ſucceſs. As the introduction of air into the cavity of this tumor muſt have been productive of the moſt grievous conſequences, it was reſolved to evacuate the matter by a ſmall ſeton, and thus a conſiderable quantity of very fetid putrid matter was let out. The phyſician, and other ſurgeon who attended him, could not underſtand how ſuch a fæculent ſmell could take place, having no apprehenſion of any perforation of the inteſtine.

tine. I told them, however, that ſuch perforation had certainly taken place, and that it would be found in the rectum. This was confirmed, by the nurſe's obſerving that he always paſſed ſome matter along with his fæces by ſtool. I had no hopes of his recovery from the firſt time I ſaw him, and the event too well verified my predictions. He languiſhed for about three weeks, and then expired from mere inanition. On diſſection, we found that the abſceſs had been originally formed in the left ſide of the acetabulum, whence it had ſpread along the obturatores interni to the os coccygis, penetrating the cellular ſubſtance, until it had at laſt reached the rectum, and corroded it near its middle and back. From the reſiſtance of the ſphincter ani, the fæces had been forced up through the wound in the rectum, a conſiderable way into the abſceſs, and in this they paſſed out at the wound newly made.

CHAP.

## CHAPTER IV.

## *OF FRACTURES.*

ANY injury done to the bones, ſo violent as to crack or break them tranſverſely, is called a *fracture*. If they happen to be ſplit longitudinally, it is named a *fiſſure*. In any bone of the body, the cranium excepted, we call it a fracture, if the bone is only cracked tranſverſely, without any ſeparation of the two ends from each other, (though this is a caſe that rarely happens); but, in the cranium, it is a fracture only when the parts of the bone are ſeparated from each other. In all other caſes it is called a *fiſſure*.

Fractures are diſtinguiſhed by different names, according to the circumſtances of the injury received. Thus, the bone may be broken directly acroſs, in which caſe it is called a *tranſverſe fracture*; it may be broken obliquely, and then it is named an *oblique* fracture; if lengthwiſe, from one end of the bone to the other, it is called a *longitudinal* fracture; and, if the bone is broken into ſmall pieces, it is named a *ſplintered*

*ed* fracture. Sometimes the bone is not only broken, but the end of it is driven through the integuments; in which caſe it is termed a *compound* fracture, though this appellation is by ſome given to that kind of injury where the bone is broken in two places; and they call it a complicated fracture where the injury of the bone is combined with a wound of the ſoft parts; but theſe names have never come into general uſe, the *compound* fracture being always underſtood to be complicated with a wound, and the term *complicated* fracture being entirely laid aſide.

Fractures are juſtly reckoned among the moſt violent injuries that can be received by the human body, being attended very frequently, not only with the loſs of a limb, but of life itſelf. To underſtand, however, in what manner the ſyſtem may be affected by a fracture, we muſt take a view of the ſtructure of the bones themſelves. When completely formed, they are whitiſh, ſolid, and almoſt inſenſible. Their ſhapes, as well as their degrees of ſtrength, are very various, though all of them may be broken by a violent blow, yet they are generally ſo ſtrong, that they can reſiſt injuries of this kind without any conſiderable detriment. The long bones are the moſt eaſily broken, for obvious reaſons; and, of all bones in the body, the cla-

vicles are the moſt fragile; not only as being very fragile in proportion to their length, but the bony lamina, or caſe containing the marrowy part, being thinner in them than in other bones. The largeſt of the long bones, ſuch as the os femoris and os humeri, are hollow tubes in the middle part, being filled only with an oily matter called marrow; but, towards the extremities, the ſtructure changes remarkably; the hard and ſolid caſe, which includes the marrow, becoming remarkably thinner; and the whole internal part, compoſed of lettice work, filled with bloody matter, and not marrow. The The hard bony caſe, on being anatomically inveſtigated, appears compoſed of many diſtinct laminæ, joined together by a kind of bony nails, which paſs from one lamina to another, and appear to be of a different ſtructure from the lalaminæ themſelves. All the bones are covered with a ſtrong denſe membrane, called the periоſteum, which appears to paſs from one to another, over the bones of the whole body, and is connected to the ſubjacent bony ſubſtance, by a a great number of fibres and blood-veſſels. The internal ſurface of the bone, which immediately includes the marrow, is likewiſe lined with a membrane called the internal periоſteum; and this membrane lines alſo all the cells in which the marrow is contained, (for this alſo has it cells),

cells), as well as thoſe in which the blood is depoſited. A vaſt number of blood-veſſels are diſperſed upon this membrane which penetrate the internal ſurface of the bone, as thoſe of the other membrane penetrate the external ſurface of it.

No anatomiſt hath yet diſcovered any nerves in the bones, and they are certainly inſenſible of any injuries done to themſelves; the pain of fractures ariſes from the hurt done to the ſoft parts by the ends of the bones. Notwithſtanding this inſenſibility, however, I remember, that, in a caſe of a patient who had an exfoliation of the tibia, the granulations of fleſh which aroſe were exceedingly painful; and I think I remember other caſes of the ſame kind in which they were alſo painful.

The uſes of the bones are to ſtrengthen and preſerve the ſhape of the human body; and hence a fracture not only totally takes away the ſtrength of a limb, but likewiſe puts it out of ſhape. Even in the ſkeleton, ſomething of the natural figure of the body is perceptible; and, by taking away or deſtroying any of the bones of the ſkeleton, we may eaſily ſee that the limb which it ſuſtained will become a mere ſhapeleſs maſs of fleſh; and, whether this deſtruction takes place, either from external injury or internal diſeaſe, the effect will be the ſame. The motion of the bones is performed by means of muſcles

muſcles with which they are covered, and by which they are made to act like levers, though they always act at a great diſadvantage, which ſhews the great ſtrength with which the muſcles are endowed.

Young animals have their bones much more ſoft and pliant than in old age; for in the animal body the oſſifying proceſs ſeems to go on to the very laſt. The pliancy of the bones of young animals ſeems to ariſe from the great number of blood-veſſels diſperſed through them, as well as from an oily or marrowy matter which ſeems to lubricate all the lamellæ of the bone; but, in old age, many of the blood-veſſels are obliterated, and the marrow ſecreted in a much ſmaller quantity than formerly. As we grow up, the number of arteries conſtantly diminiſh, not only in the bones, but in the other parts of the body alſo; and this diminution of the number of arteries is accompanied with an accumulation of earthy matter, ſo that the bones, though their coheſion be increaſed, and they become much harder, yet their fragility is greatly augmented by age. To counteract this continual tendency of the body to dryneſs and rigidity, I think it probably is, that nature has depoſited a quantity of oily matter in all the cancelli of the bones. This, we are aſſured, penetrates the whole laminated part of the bones; and, by being equally

diſtributed, undoubtedly contributes greatly to retard the fragility of the bones brought on by old age.

Thus, I think we may diſcover why the bones of young people are more difficult to be broken than thoſe of old perſons. They are more pliant; and, by yielding a little to a ſtroke, they become much leſs liable to be broken than when they are more compact, and their coheſion ſtronger. The pliancy is owing principally to the marrow, which begins to abound moſtly about the time that its preſence becomes neceſſary. In extreme old age, the marrow itſelf becomes deficient; but this we muſt aſcribe to a change in the medullary veſſels, ſuch as I have ſeen in very old people, in whom the whole arterial ſyſtem was in a ſtate of oſſification; and hence it muſt be evident, that, as in caſes of this kind, the natural ſtructure of the arteries is in a great meaſure loſt, ſo muſt their action alſo be; and thus I would account, not only for the great fragility of the bones of old people, but alſo for the difficulty there is of uniting them again when fractured. Here alſo it may be remarked, that, if the reſiſtance of the bones to fracture depends principally on the quality as well as quantity of the oily matter they contain, whatever affects the oil in either quantity or quality, may diminiſh their ſtrength, and of conſequence may

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be conſidered as one of the prediſpoſing cauſes of fracture.

That there are certain cauſes by which the human bones may be prediſpoſed to fracture is evident, becauſe ſome people have their bones much more eaſily broken than others; and the bones of the ſame perſon may at one time be broken more eaſily than at another. The prediſpoſing cauſes of fracture are, 1. The decreaſe of arterial plethora, and diminution of marrow in the bones. 2. Theſe diſeaſes which grievouſly affect the ſyſtem throughout its whole extent, ſuch as the ſcurvy, venereal diſeaſe, rickets, gout, and cancer. Theſe act principally on the gluten and oil, and hence are peculiarly deſtructive to the bones. 3. By ſome it has been ſuppoſed, that hard froſt increaſed the fragility of the bones. But this ſeems to be a miſtake. The temperature of the blood is the ſame both in ſummer and winter; and, though many more fractures happen in hard winters than at other times, we muſt derive this entirely from the ſlipperineſs and greater hardneſs of the ground in froſt, than any other kind of weather.

Though, from what has been already ſaid concerning fractures, it might be ſuppoſed that they could be very eaſily known; yet it is not uncommon for practitioners to be deceived in ſome caſes, eſpecially in the fore arm and leg, where there

there are two bones, and where one may be broken, and the other remain whole. The general ſymptoms of fracture are, 1. A total loſs of motion in the injured limb, eſpecially below the place where the injury was received. This indicates an injury done to the bone itſelf, as it is now incapable of performing its uſual office, viz. that of a lever, when acted upon by the muſcles, which move that part of the limb immediately below the fracture. 2. Another ſymptom of fracture is deformity; and this will be more or leſs conſiderable, according to the diſtance to which the parts of the bone are ſeparated. In proportion to this, the limb will be more or leſs crooked, diſtorted, or ſhortened; ſo that, in ſevere oblique fractures, one or all of theſe will take place in a very great degree; but in thoſe that are directly tranſverſe, or where the bones are but little moved from their place, there is little or no difference between it and the ſound limb. 3. Fractures are attended with very conſiderable ſwelling, tenſion, and great pain, in the adjacent parts.

From the facts already enumerated, it is evident that there is an inſeparable connection between ſwelling, tenſion, and acute pain; the firſt being nothing elſe than a determination of the blood to the parts affected, by which the tenſion and pain are augmented, as well as by the ſpi-

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culæ of fractured bones wounding the adjacent parts. 4. The ſtarting, or involuntary motion of the limb, is a great ſign of fracture. Theſe ſtartings take place, not only when the limb is not touched, but when it is moved by the ſurgeon, and proceeds from the violent ſtimulus applied to the muſcles and nerves, by the ends of the bones, or the ſpiculæ of the pieces broke off from them when the fracture is violent. The pain will be exaſperated, not only by the leaſt ſtart of the limb by itſelf, but by the motion of it with the hand of the ſurgeon, which proceeds not only from the cauſe juſt mentioned, but from the injury done to the external and internal perioſteum, as well as to the muſcles and nerves ſituated near the fractured place. 5. In many caſes of fracture, friction of the bones take place, and the bones are plainly heard to rub upon one another. Where this laſt ſymptom occurs, we know deciſively that the bone is fractured; but, when all of them are met with, it is evident that the irritation muſt be very great, the action of the veſſels much increaſed, and thus the ſize of them greatly augmented; the cellular ſubſtance at the ſame time being much augmented, by reaſon of the diminiſhed abſorption, and thus the ſwelling already mentioned is occaſioned.

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If the ſymptoms above mentioned continue for any length of time, a very high degree of inflammation takes place, along with the tenſion and ſwelling, and the pain is exceedingly augmented. Sometimes we meet with ſomething like an ecchymoſis, occaſioned by the points or ſplinters of the broken bone wounding the blood-veſſels, ſo that the blood flows directly into the cellular ſubſtance, in greater or ſmaller quantity, according to the ſize of the wounded veſſel. In ſome caſes, when the effuſion is very great, and the abſorption ſlow, the union of the broken bone is thereby conſiderably impeded, and the pain and inflammation augmented to an exceſſive degree.

A ſimple fracture is in general very eaſily diſtinguiſhed from any other injury of a limb. The only caſes in which it is in danger of being confounded with them, are thoſe of ſevere contuſion and luxation. The former, however, may be eaſily known, from the abſence of friction, as well as any curvature, or diſtortion of the limb, the motion below the part affected being alſo unimpaired. An accurate knowledge of anatomy, however, is requiſite, in thoſe who treat fractured limbs, as well as in every other part of ſurgery; and, for want of this, the people who call themſelves *bone-ſetters*, even ſuch

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as have been moſt eſteemed in their profeſſion, have often done much miſchief.

In making any prognoſis concerning fractures, there are various circumſtances muſt be taken into conſideration. The age of the patient, as we have ſaid, is a matter of importance, as is alſo the nature of the fracture. It is evident, that, in an old man of ſixty or ſeventy, we can by no means expect the union of a broken bone to be equally expeditious with that of an healthy young man of twenty; and, in like manner, it is evident that a ſimple tranſverſe fracture will require much leſs time to heal than an oblique or compound one. In a healthy conſtitution, whether young or old, fractures heal much more readily than in one that is affected by diſeaſe. The ſcurvy and venereal diſeaſe are both very unfavourable to the healing of fractures, though ſome inſtances have been met with to the contrary. Fractures of the clavicles, as has formerly been remarked, are more eaſily healed than thoſe of the other bones. Next to theſe are the ribs, the bones of the cubit, and the fibula, or ſmall bone of the leg. The large bone of the arm, and the thigh-bone, are healed with more difficulty, particularly the latter, which is ſuppoſed to be from the difficulty of retaining the ends of the fractured bone in their places. In fractures of theſe large bones, therefore,

fore, we may, without hesitation, pronounce that the cure will be tedious. Bones, when fractured near their extremities, especially the large bones, are much more difficult of cure, and produce much more dangerous symptoms than when the injury happens in any other place. This arises partly from the cellular texture of the bones in these parts, and partly from the difficulty of retaining the broken bone in its proper position.

It is of great consequence, both to the surgeon and patient, that a proper prognosis be made, otherwise the former will endanger his reputation, and the latter may perhaps be brought into danger of his life. The smallest attention must shew any practitioner that a transverse fracture may be speedily cured without any deformity or loss of motion; while, on the other hand, we are taught, by experience, that an oblique fracture seldom terminates but with one or other of these defects, especially if seated near the joint. In very bad cases of this kind, where the bone happens to be divided into several pieces, which is sometimes the case from a violent blow, it will be necessary to take the utmost care to prevent the violent symptoms formerly mentioned. In almost the very worse cases, however, we are not to despair, unless such symptoms appear as plainly indicate that the

patient muſt very ſoon loſe his life, if the limb is not amputated. Every day's experience ſhows, that the human body is endowed with ſurpriſing powers for repairing the injuries it has ſuſtained, and for reſtoring the loſs of ſubſtance even of a bone. Thus, we have many inſtances of the whole of the tibia being exfoliated, related by authors; and I myſelf have met with ſome, in all of which it was at laſt perfectly regenerated, and all the parts of it firmly united to thoſe with which, in its natural ſtate, it had a connection.

This power of regenerating the loſt ſubſtance of a bone is manifeſt, not only in natural diſeaſes of it, but when a portion is cut out or ſawn off. In all caſes, the want is ſupplied by what is named a callus, which, from the obſervations that have been made upon it, is ſaid to be firſt a liquor effuſed from the veſſels of the fractured bone. By degrees it acquires ſolidity, but never fully attains the hardneſs of the reſt of the bone, until it has been pervaded, by veſſels ſhooting through it from all the neighbouring parts; from which laſt circumſtance, it would ſeem only to be formed by an elongation of the veſſels of the bone. Thus, the callus muſt always have the ſame kind of organization with the bone itſelf, though, moſt probably, in ſome reſpects, leſs perfect than that which belonged to

the original bone. Hence, we may ſee how any morbid ſtate of the ſyſtem muſt be exceedingly unfavourable for the healing of fractures, and ſometimes put a ſtop to the healing proceſs entirely. I have met with three inſtances of fractures purely tranſverſe, in which, notwithſtanding all the care that could be taken, the patients were at laſt obliged to give over all hopes of any callus being formed. The os humeri was, in theſe patients, the injured bone; nevertheleſs, they did not loſe entirely the power of their arm. The ends of the fractured bone became quite ſmooth, and ſomething like a ſtrong membrane grew over both of them, which ſeemed to act like a capſular ligament; and, by means of it, the patient had much more uſe of his arm than one could have imagined, though, indeed, there was always a conſiderable motion from ſide to ſide. All of theſe patients had been ſubject to the rickets in their youth, eſpecially in their legs; all of them were dram-drinkers, and all were about forty-ſix years of age. Whether the ſtrong liquors they drank contributed to prevent the formation of callus, I cannot certainly ſay; but I am inclined to think that the morbid ſtate of the ſyſtem otherwiſe was ſufficient to have done ſo, without any adventitious cauſe.

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It has been ſaid, that, in pregnancy, fractures are more difficult of cure than at any other time; but, though I cannot diſpute the obſervations of others, I cannot vouch this from my own experience. In four caſes of fracture which have come under my care in the fifth, ſixth, and ſenventh months of pregnancy, two of which were tranſverſe fractures of the thigh-bone, one of the tibia, and the other of the bones of the fore arm, yet all of them were cured in the ordinary time, viz. about ſix weeks.

From what has now been premiſed, we may ſee that the callus is entirely a natural production, and that the formation of it cannot be affected by external applications, nor by medicines taken internally. Neither can it be diſſolved after it has been once formed, either by bleeding, or any other remedy we can deviſe; and the fallacy of any reaſoning in favour of the contrary doctrine needs ſcarce to be pointed out. We meet, indeed, frequently with great deformities of the limbs after every thing has been done that the chirurgical art could ſuggeſt to prevent it; but this is not to be aſcribed to any over ſecretion of callus, as has ſometimes been thought; for, if we examine into ſuch caſes, we will find, that, in moſt of them, the callus has been formed upon a part of the bone where

where the muſcles are thick and ſtrong, and the bone thin. Hence, if the reſiſtance of the muſcles is not completely overcome, the ends of the bone will not be kept in contact, by which means the callus muſt be diffuſed in that part, and the bone will be a little bent towards the ſtrong muſcles.

The cure of fractures will be found more or leſs difficult, according to the degree of injury received. In caſes of ſimple tranſverſe fracture, where the ends of the bone are ſcarce moved from their places, they are eaſily put into their natural ſituation again, with little trouble or pain to the patient; but, in oblique fractures, and thoſe which are accompanied with much injury to the ſoft parts, it will be found much more difficult to place and retain them. Sometimes fractures are accompanied with ſuch ſevere contuſion, that the ſymptoms ariſing from this cauſe alone are extremely violent, and the inflammation, ſwelling, &c. are ſo great, that no attempt can be made to reduce the fracture, until they be removed in ſome degree at leaſt; but this can only happen when there is a conſiderable interval between the accident and the ſurgeon being called; for, in general, the reduction of the fracture muſt be ſet about immediately. To allay the violent pain and inflammation attending theſe accidents, whether

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ariſing from the fracture itſelf, or the contuſion accompanying it, we muſt apply the remedies uſual in ſuch caſes. In young and healthy patients, copious general blood-letting will be found extremely uſeful; but, beſides this, blooding by leeches will be attended with the beſt conſequences. When the bones are reduced, and the violence of the pain ſomewhat abated, as well as the tenſion of the parts, they ought to be conſtantly kept moiſt with cooling and aſtringent applications, ſuch as are mentioned in the chapter which treats of inflammation; but the application of leeches ought never to be omitted, as long as the pain or ſwelling remain in the ſmalleſt degree. Great attention muſt alſo be paid to the diet of the patient, and the natural diſcharges by ſtool and urine. By perſeverance in this method, the ſwelling, pain, and tenſion, will be totally abated in ten or twelve days, provided the fractured ends of the bone have been properly replaced, and ſecured in their poſition, and the leg kept in a proper poſture. Hence, as in ſuch a ſhort time, we cannot ſuppoſe the callus to be exuberant, it is plain that the leeches, &c. can do no more than take off that great diſtenſion which took place in the veſſels of the limb, and again promote the abſorption, by allowing them to recover their tone, ſo as to carry ſome of it back again to the maſs

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of blood; though I ſhould apprehend that this muſt be very little, when the oſſific proceſs has been long begun. In all the caſes I have met with, and I have treated a great number, I never found a ſingle inſtance of ſo great a growth in the callus as ever to be worth remarking. In diſeaſed conſtitutions, indeed, ſuch as thoſe affected with ſcrophula, this may ſometimes happen; but, if the bones are kept exactly in their proper ſituation, the probability is, that, if any exuberance of callus takes place, it muſt be of a circular form, and entirely ſurrounding the bone; and ſome inſtances of this kind are given by chirurgical authors; but, where this happens to be the caſe, it is plain that no leeches, nor other remedy of that kind, can be of the ſmalleſt ſervice, any more than they could be of ſervice in removing a tumor in a ſcrophulous habit of body. In ſcrophulous patients, this exuberance of callus cannot be prevented, if the parts are ſo diſpoſed; and, even when it originates from an improper poſture of the limb, it can only be remedied while the callus is ſoft enough to allow the bones to be replaced in their proper ſituation.

In all caſes of this kind that have yet fallen under my obſervation, where any diſtortion after a fracture remained in the limb of an healthy perſon, I always found that it originated, not from the callus alone, but either from the bones

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not having been originally placed in a proper position, or from their not having been retained in it during the cure.

With regard to the cure of fractures, the surgeon ought always to remember that the end to be kept in view is to replace the broken pieces of the bone in their natural situation, and to prevent their ends, or any splinters that may be broken off from them, from hurting the soft parts. From attention to this, I have frequently derived the greatest advantage in the reduction of fractures; and I must observe, that the patient himself will know, by the relief from pain which instantaneously takes place, whether the bones be properly replaced or not. When this is done, they must be retained in their proper situation; and, if the reduction has been well performed, the patient will be free from any severe, or lancinating pains, till the cure is completed; but, if convulsive motions or startings take place, we then know that the bones are displaced, or have never been properly replaced. Thus, the whole of the surgeon's business, in the reduction of fractures, may be reduced to three articles. 1. The extension of the limb, in order to set the bone. 2. The replacing the ends of the broken bone in their proper places; and, 3. The retaining them in their proper situation. The rest of the work must be left entirely to nature, and the surgeon

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can interfere no farther, than by taking care of the general health of the patient.

Inſtances have been related by authors of fractures, where ſome of the muſcles, or a membrane, was interpoſed between the ends of the broken bone, in ſuch a manner that the reduction could not be accompliſhed, at leaſt, that the union of the bones was thereby prevented. Inſtances of this kind may poſſibly happen from a long and ſharp point of a broken bone penetrating a membrane or muſcle in ſuch a manner that it cannot be got off; but theſe caſes muſt undoubtedly be attended with exceſſive pain, as well as violent convulſive motions of the limb. Such caſes will moſt probably occur in very ſevere compound fractures; but the ends of the fractured bone may alſo be prevented from meeting, by a ſplinter of the bone itſelf. When this happens, it is impoſſible to effect a cure in any other way, than by removing the offending body. I think it muſt be eaſy to diſcover whether the junction of the bones be prevented by the interpoſition of any membraneous ſubſtance, and that whether the fracture be tranſverſe or oblique. The grating ſound, occaſioned by the friction of the bones upon one another when the limb is moved, cannot be heard in ſuch a a caſe; but, by proper attention, while the limb is extending for the reduction of the frac-

ture, and moving the under part in such a manner as to favour the removal of the substance from between the ends of the bones, we may generally obtain a perfect union of the bone, and effect a cure.

In the cure of fractures, it is almost always necessary to extend the limb with some force; the reason of which is this: All the muscles of the human body are, during life, endowed with a remarkable power of contraction, called, by authors, *vis insita*, and which they constantly exert. In an healthy state, this power is counteracted by the bones; but, when one of these happens to be broken, the muscles attached to the lower part, being violently stimulated by its sharp edges and points, contract themselves to such a degree, that the broken end of the lower bone frequently overlaps the other for three or four inches. The design of extending the limb, therefore, is to pull back the under part of the bone, and to apply the end of it to that of the upper part, that so a cure may be effected. The The force requisite to accomplish this must always be in proportion to the strength of the muscles, and their degree of contraction; but, with regard to the force necessary to be applied, as well as the mode of applying it, practitioners have not only erred very much, but erected their

errors into a regular ſyſtem. Beſides the extenſion juſt mentioned, the deſign of which is to pull the under part of the bone downwards, they would needs have what they called a *counter-extenſion*, a word which, if it has any meaning, muſt imply the pulling of the upper part of the bone upwards, a thing impoſſible, becauſe that part is reſiſted by other bones, and cannot be moved. But the worſt was, that, in making the extenſion, they directed the fractured limb to be placed in a ſtraight poſture, and the pull to be made ſo ſtrong, that the ends of the bones might be ſeparated to ſome diſtance from one another, before they were allowed to come into their places. Hence, ſuch an enormous force was required, that not only the hands of aſſiſtants, but ligatures, and even machines, were neceſſary. Thus was the poor patient, as it were, put on the rack, while the limb was ſtretched beyond its natural length, and the parts already injured or lacerated by the fractured ends of the bone are diſtended beyond meaſure, and the pain thus increaſed to an incredible degree. This abſurd practice continued till the time of Mr Pott, who greatly improved this part of ſurgery. He eaſily ſaw that the great difficulty in the reduction of fractures, and the neceſſity there was for uſing ſo much force, aroſe ſolely from keeping the limb in a ſtraight poſture, becauſe

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thus all the muſcles acted with their full force to pull back the fractured part, and ſo counteract the extenſion. The remedy for this is very eaſy, being no other than to put the limb in ſuch a poſture that the muſcles may be relaxed, inſtead of having them ſtretched out, by keeping it ſtraight. When this is obſerved, there will very ſeldom be any occaſion for much force. The hand of the ſurgeon himſelf will often accompliſh all that is neceſſary, as I have often experienced; and, where this can be done, it ought always to be ſo in preference to every other method. Even in the thigh-bone, where the muſcles are ſtrongeſt, I have often reduced a fracture, with the aſſiſtance only of a female nurſe. I would, however, be far from aſſerting, that mechanical means are never neceſſary for making an extenſion in caſes of fracture; but it is only in very ſtrong people, where the thigh-bone is fractured near its upper extremity, and where the ſtrong muſcles all conſpire to retract the bone.

In making the extenſion, it is proper to apply the force immediately below the fractured place, and not to any diſtant part of the limb; for, if we pull the limb by a diſtant part, and a joint happen to intervene betwixt the part by which we pull and the fracture, there is danger, not only of ſtretching the ligaments in ſuch a manner

ner as to weaken the joint, but of luxating it entirely. The operation ſhould be performed as ſoon as poſſible after the injury has been received; or, if this could not be done, and great ſwelling and tenſion with intenſe pain have taken place, theſe ſymptoms muſt be removed, by the methods already laid down, always remembering to keep the joints bent, in order to relax the muſcles, which ought not only to be done at this time, and during the operation, but throughout the whole courſe of the cure. The adventitious ſymptoms of pain and ſwelling, if proper remedies are applied, will quickly abate. I have known them almoſt entirely removed in thirty-ſix hours; after which, extenſion has been made, and the bone reduced without any trouble.

It is upon a proper degree of extenſion that the cure of a fracture, and the ſtraightneſs of the limb after the cure, principally depend; and, therefore, the greateſt attention is to be paid to this part of the operation. The force required for making it depends upon circumſtances; but it muſt always be ſufficiently great to allow the fractured ends of the bone to meet in their natural ſituation. The replacement of the bones exactly conſtitutes the whole nicety of the operation, and the ſurgeon ought to pay the greateſt attention to it; for, unleſs the bones are replaced

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in the very ſame ſituation they were before, ſo that every prominence or cavity in the under end of the fracture may meet its correſponding cavity or prominence in the upper one, it is impoſſible to prevent a deformity after the limb is healed. Here an accurate knowledge of the human frame is abſolutely neceſſary; and the ſurgeon will derive much aſſiſtance from comparing the ſound limb with the broken one after the bones are replaced, as thus he will at once diſcover if there be any inequality, and be able to remedy it. For performing this part of the operation, no directions can be given; but every ſurgeon muſt depend on his own judgment and obſervation.

The laſt part of the operation, in the cure of fractures, is the retaining of the ends of the bone in their proper poſition, which, though equally important with the reſt, is by far the moſt difficult and troubleſome of the whole. Inattention to this, even for a moment, either on the part of the ſurgeon or patient, may at once make all that had been done, even though the bones had been ſet in the moſt perfect and complete manner; and the ſurgeon ought to be the more particularly careful in this reſpect, that whatever be the cauſe, whether his own fault, or that of the patient, he is almoſt always ſure to be blamed. I believe that moſt of the deformities which

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take place after the cure of fractures, are either entirely, or in great meaſure, owing to this diſplacement; for which reaſon, I ſhall enumerate ſome of the cauſes by which it is commonly occaſioned: Theſe are, 1. The number and ſize of the ſurrounding muſcles, from whence we muſt eaſily ſee, that, according to the vigour of the patient himſelf, and the degree of muſcular ſtrength he poſſeſſes, the danger of the bones being diſplaced is the greater. This is moſt remarkable in fractures of the thigh-bone near the neck. 2. A great difficulty in retaining the bones, ariſes from the thickneſs of the parts, as well as in ſome caſes, from their ſhape, by which the ſplints and bandages are kept at too great a diſtance from the fractured bones, ſo that their effect is almoſt entirely loſt. For, though theſe may be applied to the parts adjacent to the fracture, with as much tightneſs as is conſiſtent with their ſafety, yet it is poſſible that the fracture may meet with little or no reſiſtance, when the bones attempt to ſeparate. 3. In oblique fractures, the danger of ſeparation is greater than in tranſverſe ones; for nothing can be more evident, than that, according to the contraction of the muſcles, as well as the obliquity of the fracture, and ſize of the parts, ſo will the danger of the derangement of the ends of the bone be. 3. The ſhape of the part affected. The more

more this deviates from that of a cylinder, and approaches to a cone, the more disadvantageous hold will our bandages have of the included parts. The thigh is a strong proof of this observation, particularly if the patient is very muscular and plump. 5. The restlessness of the patients themselves. After what has been said, it is almost needless to observe, that the keeping of the limb steady is absolutely necessary towards the accomplishment of the cure; and that, in oblique fractures, bones are very easily displaced after they have been put into their natural situation. 6. Convulsive startings, attended with cough, and reaching to vomit. These symptoms are quickly brought on in delicate and irritable constitutions, from the injury done to the muscles, by the sharp points or splinters of the bone; and, as they must necessarily occasion violent concussions through the whole body, the fractured bones must also frequently be displaced by reason of them. A diarrhœa is likewise apt to be attended with bad consequences, on account of its obliging the patient to change his posture frequently.

From what has been said, it must be evident that there is a very considerable difficulty in retaining the bones in their situation after they are replaced; and it is owing to this entirely, that, in healthy subjects, when great care is not taken,

taken, we frequently find very unſightly tumors, and diſtortions about the fractured place. To ſecure the bones properly, therefore, has always been reckoned a matter of great importance; and accordingly it has always exerciſed the ingenuity of ſurgeons to find out the beſt method of doing it.

The ends of a fractured bone may be retained in their places by various means, as bandages of different forms, and different materials, both ſoft and hard. The ſoft are made of cloth of different kinds, the other of paſteboard, leather, wood, metal, &c. called ſplints or machines; but it muſt be remembered, that the only intention of bandages, in tranſverſe fractures, is to defend the part from external injuries, by which the ends of the bone might be diſplaced; but, in oblique fractures, they are deſigned to reſiſt not only external injuries, but internal, or ſuch as ariſe from muſcular contraction alſo. In a ſound ſtate of the body, the contraction of the muſcles is always reſiſted by the bones; but, when any of them is broken, and of conſequence this reſiſtance deſtroyed, the bandages and ſplints ought in ſome meaſure to ſupply its place. If they do not, they will do more harm than good, by preventing the ſurgeon from examining the ſtate of the parts.

From this view juſt given of the uſe of bandages in the cure of fractures, we may eaſily ſee that ſomething more ſolid than cloth is neceſſary to be applied in the cure of fractures, in order to retain the ends of the bone in their proper places. Splints, therefore, have been always found an eſſential part of the apparatus. The uſefulneſs of theſe, however, depends entirely upon the manner in which they are applied; for, by miſmanagement in this reſpect, they frequently do more harm than good. Sometimes they are made ſo ſhort, that they can act only upon the place where the fracture is, not reaching as far, either upward or downward, as the roller extends; and thus they can have no other effect than as compreſſes, and theſe too made of bad materials; whereas the proper uſe of ſplints is not at all to act as compreſſes, but to keep the limb ſteady, which it is impoſſible they can do, if they are not of a ſufficient length. If the leg happen to be broken, they ought to be as long as to reach above the knee, and below the ancle, and lined with ſome ſoft matter to keep off their preſſure from the fracture, and cauſe it fall only upon the joints. Thus, they keep the foot, as well as the whole leg, ſteady; while, if they are made ſo that they can preſs only upon the fracture, it is always liable to be diſplaced, by the ſmalleſt motion of the foot, and

likewiſe do hurt, by preſſing the edges and points of the fractured bone againſt the ſoft parts. It is abſurd to think of ſupplying the deficiency, in length of the ſplints, by any other contrivance; for, if we uſe any thing elſe, the ſplints may as well be laid aſide; and it is certainly much better to make them at once of the proper length, which can ſo eaſily be done, than to multiply ſuch things unneceſſarily, which can only ſerve to incumber both patient and ſurgeon. When the os femoris is fractured, if the limb be placed in a ſtraight poſture, the ſplints ought to reach from the hip to the outer condyle on the outſide, and from the groin to the inner condyle of the knee on the inſide. Two ſplints of a proper ſhape and ſize are quite ſufficient for any fracture; the matter with which they are lined, which may be either linen or flannel, folded ſeveral times, ought to be ſtitched to them from one end to the other; and, on their back part, they ſhould have ſeveral ſtraps of flannel or ſtrong tape, at equal diſtances, and of ſuch a length, as to ſurround the limb eaſily, and tie over the oppoſite ſplint.

Bandages are always neceſſary for ſecuring the ſplints, and ought to be made in ſuch a manner as to be eaſily applied. A long roller muſt therefore be productive of great inconvenience, and ought never to be uſed in caſes of fracture.

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A twelve or eighteen tailed bandage is greatly to be preferred, or circular ones, which are ſimilar to them, and put once, or at moſt twice, round the limb. The ſplints, above deſcribed, will anſwer very well for a circular bandage. By making uſe of bandages of this kind, we may inſpect the limb at pleaſure, as they are ſo eaſily removed, which we would find very inconvenient, if not altogether impracticable when a long roller is made uſe of. Circular bandages, or the other juſt mentioned, are extremely uſeful in compound fractures. They may be made either of flannel or linen; but, in winter, I always prefer flannel, and uſe linen in ſummer.

Splints are commonly made of paſteboard; and, when made of this material, and of the ſtrongeſt kind of it, anſwer very well in tranſverſe, or ſlight oblique fractures. After they have been cut of a proper ſize, (and, if for the leg, having a hole cut in each ancle), they muſt be moiſtened with equal parts of vinegar and water, by which means they will adapt themſelves to the ſhape of the limb, thus facilitating the cure, by retaining the ends of the bone more perfectly. Splints are alſo ſometimes made of thin wood, covered with leather, and divided into a number of ſmall ones about half

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an inch in breadth; but, with theſe, it is evident that the fractured limb never can be kept as ſteady as with ſtrong paſteboard, and beſides, muſt be much more inconvenient and troubleſome in the application; nor, indeed, can they be made to apply as cloſely, either by moiſture or preſſure as the other.

Wooden ſplints, particularly thoſe compoſed of a number of ſmall ones, are particularly recommended in compound fractures, where the paſteboard would be deſtroyed by the quantity of matter; but it muſt be carefully remembered, that all ſplints, whether of wood or paſteboard, ought to be made of ſuch a length as to reach from joint to joint in the fractured limb; and, if made for the leg, they ought to have holes for the ancles.

In caſes of fracture, it very often happens that the under part of the bone is depreſſed below the other in ſuch a manner, that the end of the upper part appears as an hard prominence. Bone-ſetters, and unſkilful practitioners in ſurgery, are apt to miſtake this appearance, and to imagine that this end of the bone, which is really in its natural poſition, has actually riſen up, and that it is neceſſary, by ſtrong compreſſion, to put this down, inſtead of raiſing up the other, and adapting the ends of the two to one another. Thus, the patient is put to much pain,

pain, without doing him any real good; nay, ſometimes much miſchief is occaſioned, while the real ſetting of the bone, and putting it again in its natural place, is entirely neglected. Mr Pott mentions a ſurgeon who had invented a machine for effectually putting down, as he thought, this riſing end of the bone. It was conſtructed on the principle of Petit's tournegnet; but the firſt time it was tried, inſtead of accompliſhing his purpoſe, (which could not have been done without breaking the bone over again), the prominent part was driven through the ſkin, and the ſimple fracture changed into a compound one.

This prominence takes place when the collar bones, os femoris, or the tibia and fibula, are broken, and is occaſioned by the action of the muſcles, the motion of the limb, or even by the mere weight of it; and the diſplacement always happens in ſuch a manner, that the under part of the bone gets below the other. Hence the prominence which ignorant practitioners ſuppoſe to be a riſing up of the bone; but theſe muſt always be diſappointed in their intentions, though they ſhould make uſe of ever ſo many bolſters, bandages, and compreſſes, while the judicious practitioner, knowing the true ſtate of the caſe, will be able, merely by extending the under part of the limb, till they come in con-

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tact to accompliſh a cure, as far as art can remedy the injury.

The next care of the ſurgeon muſt be, after having reduced the fracture, and taken means for ſecuring the bones in their proper places, to put the limb in that poſture which may be leaſt painful to the patient; and this will generally be ſuch a one as relaxes the greateſt number of muſcles. Thus, when the os humeri is fractured, we muſt bend the fore arm, by which the muſcles will be relaxed; but, when the thigh-bone is fractured, we find a much greater difficulty in relaxing all the muſcles. Mr Pot directs, that, in caſes of this kind, after the fracture is reduced, and the bones ſecured, we ſhould lay the thigh and leg upon the pillow in the ſame poſture in which the extenſion had been made, viz. with the knee bent, directing the patient to lie alſo upon his ſide; and he condemns the uſe of cradles, boxes, or any kind of machinery, for keeping the limb ſtraight. I cannot help, however, being of opinion, that this is little more than truſting the cure entirely to unaſſiſted nature. The muſcles of the thigh are ſo numerous and ſtrong, that, in caſes of oblique fracture, we can never expect to retain the bones in their ſituation without the aſſiſtance of ſtrong ſplints, or ſome machine. Not that I mean to contradict Mr Pott, with regard to the poſture

poſture of the limb; I am convinced that it is the only proper one; but, without artificial means, I do not think that we can be certain of avoiding a deformity in the limb after the fracture is healed.

Having now enumerated the moſt eſſential particulars relative to the cure of fractures in general, I ſhall ſay ſomething concerning the beds on which the patients are to lie. This is a matter of more importance than is commonly imagined. Moſt of the beds in common uſe yield very much in the bottom; and, if they are otherwiſe very ſoft, the patient will ſink in ſuch a manner as to endanger the diſplacing of the bones; and I am perſuaded, that, in this way, they are more frequently diſplaced than people are aware of, eſpecially when the ſplints are of two ſoft a nature. To avoid this, we ought to chooſe ſuch a poſition that the patient may lie upon his back, and at the ſame time have it in his power to turn eaſily to his ſide when there is occaſion, without diſturbing the poſition of the fractured bones. The bed which ſeems to be moſt proper for patients who have a fracture of the thigh-bone, muſt be formed of two hair mattreſſes, the uppermoſt of which ought to be the thinneſt, but doubled in ſuch a manner that the patient's body and thighs may reſt upon it,

it, the legs and feet projecting over. Thus, the knee will be ſufficiently bent to relax all the muſcles; and the patient's body may, in a few day, be raiſed, by putting ſome pillows from the ſmall of the back upwards, ſo that he may be partly in a ſitting poſture, without the leaſt danger of diſturbing the poſition of the bones. When the fracture is below the knee, we may eaſily place the limb on the ſurface of both beds now placed upon one another, with the knee bent upon a pillow, the thickneſs of which muſt be varied according to circumſtances. Having thus diſcuſſed all the moſt neceſſary particulars relative to fractures in general, I now proceed to treat of thoſe of the different bones of the body, thoſe of the cranium being already treated of.

## SECTION I.

### *FRACTURES OF THE BONES OF THE NOSE.*

THESE are very dangerous, not only as they affect the ſpeech, and ſenſe of ſmelling, but becauſe they impede reſpiration, and eſpecially as they are in the neighbourhood of the brain,

from whence the moſt miſchievous effects muſt frequently enſue. As the bones of this part, however, form an arch, it thence happens that fractures of them happen much more ſeldom than of others; however, they ſometimes do happen from blows acroſs the face with ſticks, falls from horſes, &c.; and, if the injury has been very great, it is not without very conſiderable attention that a deformity can be prevented, abſtracting from all conſideration of the dangers juſt mentioned.

In the cure of fractures of this kind, the buſineſs of the ſurgeon is to elevate the depreſſed parts to their true ſituation. The parts which happen to be driven up beyond their natural poſition muſt be put down again, and fitted to one another, until the pain abates, and no inequality can be felt by the ſurgeon. If any ſmall pieces be found detached from the reſt, they muſt be taken away altogether, whether they be on the outſide or inſide, provided they cannot be replaced exactly in their places. The patient muſt be laid on his back, oppoſite to a window, with his head and ſhoulders a little raiſed. The director, or ſpatula, muſt be introduced into one of the noſtrils; firſt into that one where the bone is moſt depreſſed, with the right hand; while the left is employed in elevating the bones,

and the forefinger and thumb of the right in putting them again into their proper ſituations. If neceſſary, we muſt do the ſame to the other noſtril. There is not here the ſame danger, as in other fractures, of the bones being difplaced, becauſe they have no motion, nor any muſcular action to ſuſtain; nevertheleſs, they may happen to fall inwards, in which caſe they muſt be ſupported, by tubes of a proper ſhape introduced into the noſtrils. Theſe ought to be covered with ſoft lint, ſpread with any emollient ointment, and are to be kept in the noſtrils as long as any danger remains of the bones being moved from their place. The patient himſelf muſt be very cautious not to injure the ſituation of the bones, by touching his noſe but as ſeldom as poſſible, for a long time, until the bones be united.

In caſes of compound fracture, or where a wound has taken place, the utmoſt care muſt be taken to prevent the air from having any acceſs to it, which may be done by a ſmall bit of caddice, moiſtened with a little compound tincture of benzoin, and carefully applied all over the ſore, and repeated as often as occaſion may require; after which, the whole noſe muſt be covered with ſeveral folds of linen, moiſtened in ſolution of ſugar of lead, which application is alſo to be continued till every ſymptom of inflammation

flammation ceaſe. If the bones be exactly replaced, there will be no occaſion for any bandage; and, if they have not, there is no bandadge that we can apply which will be of any uſe.

Where any conſiderable hæmorrhage happens, which is by no means uncommon in fractures of the noſe, we muſt uſe the means formerly mentioned, when hæmorrhages from the noſe were treated of, perſevering in the uſe of them until a cure is accompliſhed. But if, inſtead of hæmorrhage, ſymptoms of inflammation come on, they muſt be cured by veneſection, local blood-letting, and an antiphlogiſtic regimen. Thus, I have cured two patients who had the bones of their noſe fractured, one by a fall from his horſe when drunk, the other by a blow croſs the face. Both recovered ſo perfectly, that there is not now the ſlighteſt veſtige of the injury to be perceived, except a ſlight depreſſion between the eyes. When the bones are ſo much ſhattered that we cannot by any means procure a reunion of them, the only thing we can do is to take away the looſe pieces, and truſt the cure to nature.

SECT.

## SECTION II.

### *FRACTURES OF THE UPPER AND UNDER JAW.*

I believe it is ſeldom that fractures of the upper jaw are met with, unleſs they are occaſioned by the kick of a horſe, or ſuch like accidents. Fractures of this kind are likewiſe dangerous, as well as thoſe of the noſe. If the fracture happens to run up towards the eyes, the moſt violent inflammations are ſometimes produced; and, if they happen to penetrate the antrum maxillare, they can ſeldom be removed without leaving a great deformity, the cure being likewiſe extremely tedious.

Fractures of this kind are generally accompanied with wounds; and it is neceſſary to be as attentive as poſſible to the replacing of the bones in their natural ſituation, in order to avoid the deformity juſt mentioned, and which muſt inevitably take place, if we are obliged to remove any conſiderable part of the bone.

In fractures of this kind, the bones are, for the moſt part, driven inwards, by which means we will ſometimes be under a neceſſity of removing

moving a piece, to be able to raiſe the other parts to their former ſituation. This may be done by means of the ſame inſtruments formerly made uſe of in fractures of the cranium. After this, the ſides of the wound muſt be brought into contact, and kept in this ſituation until they unite. The tendency to inflammation will be in proportion to the injury done to the antrum, and the means to prevent or allay it, mentioned in the firſt volume of this work, muſt be carefully made uſe of; but if, after all our endeavours, a ſuppuration ſhould come on, and the matter fall down to the roots of the teeth, it is poſſible that one or two of the dentes molares may be driven out, and the matter will have a vent through their ſockets; but, if it happens otherwiſe, we muſt keep open the under edge of the wound, and ſecure a paſſage from the antrum itſelf, until the quantity of matter is diminiſhed, ſo that the wound may be allowed to heal up. If matter is allowed to be pent up in the cavity of the antrum, a ſinous ulcer is the conſequence, which will ſometimes continue for many years, and can at laſt only be healed, by making an opening in the moſt dependent part of the cavity, as has been formerly mentioned, when treating of abſceſſes in that part.

SECT.

## SECTION. III.

### *FRACTURES OF THE LOWER JAW.*

THOUGH the bone of the lower jaw is very ſtrong, yet, as it expoſes a large flat ſurface in the way of injuries, it is frequently broken by violent blows upon it, either in its anterior or lateral parts. If the injury has been done to the anterior part, and been ſo violent as to divide it, a conſiderable ſeparation of the parts will be obvious, ſo that the fracture cannot be miſtaken. If one ſide only is fractured, the injury is more difficult to be diſcerned, though in general it may be known by the exceſſive pain, the crackling noiſe, grating of the bones, and irregularity of the teeth, and an inability to move the jaw. In other caſes, when part of the one ſide is completely ſeparated from the reſt, there is a conſiderable depreſſion of one part, and elevation of the other, the fractured piece being always pulled up by the muſcles.

After the ſurgeon is aſſured that a fracture of the jaw has taken place, he muſt endeavour to replace the bones as quickly as poſſible. The patient

patient muſt be placed in a proper light, and his head ſecured. The operator is then, with the fingers of one hand, to preſs upon the inſide of the jaw, while, with the other, he takes care that there be no inequality in the poſition of the bones. If one of the teeth happen to be ſeated in the courſe of the fracture, it ought to be extracted immediately; but, if any of them are forced out of their ſockets, they ſhould be replaced, and proper means taken to ſecure them in their places. The fractured bones ſhould be ſecured by a compreſs and bandage, for there is no occaſion for ſplints. The compreſs ſhould be thick, laid over the chin, and ought to extend from ear to ear along each jaw. The bandage ought not to be more tight than is juſt neceſſary to keep the fractured bones in their ſituation. During the cure, the patient ought to be kept extremely quiet, to take nothing ſolid, and ſhould carefully avoid every motion that may in the leaſt tend to diſplace the bones. If only one ſide of the bone is broken, he may be allowed to ſpeak, or eat meat which is not very hard, in three weeks; but, if both are broken, he ſhould not do ſo till after five weeks from the injury. In compound fractures of the jaw, where there is a neceſſity for inſpecting the wound frequently, we muſt take the utmoſt care to prevent the bones from being diſplaced,

diſplaced, for which purpoſe an aſſiſtant ſhould ſupport the parts with his hands, while the bandage is taking off, and applied anew.

## SECTION IV.

### *FRACTURES OF THE CLAVICLES.*

THE ſituation of theſe bones expoſes them to injuries, and the ſlender form of them renders them very liable to be fractured; but the fracture is leſs dangerous than that of any other bones of the body. A fractured clavicle is eaſily known by the grating noiſe which is heard on moving ſmartly the arm of the ſame ſide. That end of the bone which is connected with the humerus, is alſo commonly pulled to ſome diſtance from the other by the weight of the arm, the motion of the humerus being alſo impeded, and the parts ſwelled, with a conſiderable degree of pain. That part of the clavicle, next the ſternum, is commonly higher than the other; and here the notion of the bone having *riſen up* has very generally taken place. In the cure, therefore, very tight bandages, compreſſes, &c. have been uſed, by which the patient is put to a

great deal of pain, without advancing the cure in the leaſt; for, if we apply ſuch a force as is neceſſary to preſs down the prominent part of the bone, we will undoubtedly put it through the integuments. The purpoſe is fully anſwered, merely by raiſing the arm; for thus, if the arm is ſupported at a proper height, the depreſſed part of the clavicle will be raiſed up, and put into contact with the ſuperior part. Sometimes, indeed, when the fracture is very oblique, we may not be able to bring the ends of the bone perfectly in contact with each other; but it will always be poſſible to reduce the fracture in ſuch a manner as to prevent any deformity after the cure, and likewiſe to render the bone ſufficiently ſtrong. The ends of the bone may be ſecured in their places, by properly ſupporting the arm by a ſling hung round the neck, and made to fit the length of the arm exactly, though perhaps the leather-caſe, repreſented Pl. 1. Fig. 5. may anſwer the purpoſe better. The caſe ſeems to ſupport the elbow and fore arm much better than the ſling; and it is a matter of great importance that the elbow ſhould be ſupported; for, if it be allowed to fall down, the ends of the fractured bones will again be ſeparated.

Many directions have been given, in caſes of fractured clavicles, for drawing back the ſhoul-

ders, and raiſing the head; and inſtruments have been contrived for theſe purpoſes. There is, however, no certain direction that can be given for keeping the head in any poſture preferable to another, as ſometimes the cure ſucceeds beſt when it is in one poſition, and ſometimes in another. In general, the treatment of fractured clavicles ought to be the ſame with that of other bones. When they happen to be ſplintered, the ſplinters muſt be removed, but with the greateſt caution, on account of the vicinity of the ſubclavian artery. The union of the bones commonly takes place in a fortnight; but the arm of that ſide ſhould never be uſed till three or four weeks after the fracture has been reduced.

## SECTION V.

### *FRACTURES OF THE STERNUM.*

THIS bone is placed ſo much out of the way, that fractures of it ſeldom take place. By violent blows, as in boxing, however, it is ſometimes broken, and the fracture is very dangerous, on account of the vicinity of the large blood-veſſels near the heart. The ſymptoms which

which accompany it are violent pain in the part where the fracture is, oppreſſed breathing, and cough, the pulſe quick, and ſometimes oppreſſed.

As fractures of the ſternum are very dangerous, ſo are they very difficult to be reduced, on account of the little acceſs we have to the bone. When the injury has not been very violent, practitioners have ſuppoſed that the bones might be preſſed outward, by laying the patient on his back on a barrel, and deſiring him to make frequent and deep inſpirations; and, after he had been for ſome time in this poſture, putting on an adheſive plaſter upon the fractured place; after which, by pulling up the plaſter, the bones would be reduced. But, by following this method, there is great danger of doing the patient an irreparable injury; for, by frequent and deep inſpirations, the contents of the thorax are preſſed towards the ſternum with ſuch force, that they may be very much hurt, or even wounded. If the above mentioned ſymptoms, therefore, are not relieved by blood-letting, and other antiphlogiſtic remedies, we muſt make an inciſion, on the fractured place, of ſufficient magnitude to allow us to examine the bone freely; after which, the broken pieces may be raiſed with the handle of a common ſcalpel, or levator. Sometimes recourſe muſt be had to the trephine to perforate the adjacent parts,

parts, in order to aſſiſt in raiſing the depreſſed parts; but to attempt to uſe it, either for the purpoſe of evacuating water from the pericardium, or for diſcharging extravaſated blood ſuppoſed to be lodged within the duplication of the mediaſtinum, would be both ineffectual and raſh. The only intention is to elevate the depreſſed bones, and to remove any ſplinters that may be likely to injnre the internal parts.

## SECTION VI.

### *FRACTURES OF THE RIBS.*

THESE bones are known to be fractured, by the intenſe pain and grating feel which takes place after any blow upon the ſide, and by feeling the part with our finger where the continuity is deſtroyed. If the injury is not very violent, the pain is moderate in proportion, and the patient is free of fever, and ſoon recovers; but, in ſome caſes, where a rib has been ſplintered, or one of the ends of the bone driven into the lungs, the ſymptoms are very violent, and frequently terminate in death. The patient, even from the beginning, has the breathing extremely

ly difficult, the cough ſevere, attended with ſpitting of blood, and a quick pulſe. Sometimes the air eſcaping from the lungs, when wounded, by a fractured rib, gets into the cellular membrane, an emphyſema, or windy ſwelling, takes place, not only about the thorax, but over the whole body. Where this does not happen, it is confined within the cavity of the thorax, compreſſes the lungs, and thus occaſions extreme diſtreſs to the patient, by preventing him from breathing. This effect is produced in a much greater degree, where the blood flows into that cavity from one of the intercoſtal arteries that happens to be wounded by the broken rib; and, if not ſpeedily relieved, may kill the patient in a very ſhort time. This can only be done by a paracenteſis of the thorax, performed in the manner already deſcribed in the former part of this work. The emphyſema is to be removed, by ſmall inciſions with a lancet made all over the body to let out the air.

Having no acceſs to the ribs as to other bones of the body, we cannot reduce them in a ſimilar manner, ſo that we muſt here, as in the ſternum, content ourſelves with a kind of palliative cure. In the caſe of fractured ribs, one of the ends of the bone may riſe out of its natural poſition, and it is proper to depreſs it, by means of compreſs and bandage. A broad belt of leather, lined

with flannel or cotton cloth, quilted, will be very proper to prevent it from riſing, after being once depreſſed. It is to be drawn as tight round the body of the patient as he can bear it, and kept on for ſeveral weeks after the accident. The patient ought, for a conſiderable time, to be careful of making any violent exertion, eſpecially if of a conſumptive habit, as the irritation produced by the fractured bone muſt often, in ſuch caſes, do much miſchief. In very violent injuries, where the patient is affected by ſevere cough, oppreſſed breathing, and other diſtreſſing ſymptoms, we muſt proceed to make an inciſion upon the fractured part, in order to extract the ſplinter which hurts the lungs, or to raiſe the depreſſed portion of bone which may be beat in upon them. The method of doing this is the ſame as in the ſternum.

## SECTION VII.

### *FRACTURES OF THE VERTEBRÆ, OS SACRUM AND COCCYX, AND OSSA INNOMINATA.*

THE vertebræ are ſo ſtrong, and ſituated ſo far out of the way of injuries, that they are ſeldom or never fractured but in gunſhot wounds; and,

and, when they do happen to be ſo, it is always attended with extreme danger, if not with certain death. The reaſon is, that the ſpinal marrow, roots of the ribs, &c. are ſo much injured, as to be unable to carry on the functions of life. Frequently a ſuppreſſion of urine, or of fæces, or both, takes place; but, if the body of any of the vertebræ happens to be completely broken, there is no cure that will prove effectual; but, if only the ſpinous proceſſes are injured, there is a poſſibility of the patient's recovery; though, even here, the caſe is very doubtful, on account of the vicinity of the ſpinal marrow, which cannot be any way injured in a conſiſtency with life. When the patient continues free from any paralytic affection, we may be ſure that the body of the vertebræ remains whole; and, if the injury has been the effect of a blow, we can then aſſure ourſelves that it is only a fracture of one of the ſpinous proceſſes; for the other proceſſes lie ſo deep, and ſo much out of the way of any injury, that nothing leſs powerful than a bullet can be ſuppoſed to break them.

In fractures of the ſpinous proceſſes, the ſurgeon muſt replace the bones with his fingers, ſecuring them in their places by a compreſs and napkin tied firmly round the body, and further ſecured by a ſcapulary. Every method muſt be taken to prevent inflammation, which is here more

more dangerous than in moſt other parts, on account of the vicinity of the ſpinal marrow. The patient muſt, as much as poſſible, be confined to one poſture till the bones reunite. The cure, however, muſt always be uncertain; but, even in the moſt dangerous caſes, unleſs the texture of the ſpinal marrow be abſolutely deſtroyed or injured, we are not to pronounce the patient to be beyond the reach of aſſiſtance. Where the marrow is only compreſſed, we may have hopes of a cure. There are inſtances of one of the vertebræ having been pierced with a bullet which lodged in it, and, by compreſſing the ſpinal marrow, occaſioned a paralyſis; but, on extracting the bullet, the patient has been relieved, and at laſt recovered perfectly. In like manner, if any of the bodies of the vertebræ themſelves are broken, the pieces which compreſs the marrow may be taken away, and then the patient has a chance for recovery; but, if they happen to be driven in upon it in ſuch a manner as to deſtroy its texture, or a ſplinter to ſtick in the medullary ſubſtance itſelf, then indeed there are no hopes of recovery; for the ſlighteſt injuries of the medulla ſpinalis are always mortal, as well as a long continued compreſſion, of which we have numberleſs inſtances in the writings of chirurgical authors.

§ 1. *Fractures*

### § 1. *Fractures of the Vertebræ.*

In violent injuries of the vertebræ, where the bodies of them are broken in such a manner as to compress the spinal marrow, we must make an incision on the fracture, and carefully remove the fractured parts, or raise up that which is depressed; and, from whatever cause the accident may have happened, the surgeon ought never to hesitate at examining the nature of the injury as fully as he can. But if, after this examination, the vertebræ shall be found so completely fractured that, part of it is driven in upon the marrow, then indeed he may pronounce the case incurable. If otherwise, after removing the offending parts, he is to bring the sides of the wound together, and dress it as in a fracture of the cranium, keeping the body fixed by means of pillows, and as much as possible in one posture. Every wound here must be dressed with the utmost care and attention, to exclude, as much as possible, the atmosphere and the inflammation it is apt to excite; for, if this is not kept under by every possible method, a great suppuration will undoubtedly ensue, and death itself be the consequence.

### § 2. *Fractures of the Os Sacrum and Coccyx.*

In cafes of this kind, the danger is equally great as in fractures of the vertebræ; for any injury of the ſpinal marrow, even at its very extremity, is certainly attended with death. In fractures, both of the ſacrum and coccyx, but eſpecially of the latter, we are to attempt the reduction of the bones, by introducing the fingers of the left hand into the rectum to puſh outward the depreſſed part, while the other is employed in reducing them into their proper places. They may afterwards be retained in their natural poſition by a T bandage, keeping the patient in bed until he is fully recovered; and, after he firſt gets up, preparing a ſeat for him with a hole in it, which he will find eaſier than any other. It muſt be remembered, however, that fractures of this kind are extremely difficult of cure, and the patient's recovery muſt always be very doubtful.

### § 3. *Fractures of the Oſſa Innominata.*

Theſe bones, from their ſituation, cannot be fractured without a very violent injury; and, when they are ſo, it is often impoſſible, by reaſon

ſon of the thickneſs and ſtrength of the muſcles, to diſcover the ſeat of the injury by the feel. In this caſe, all that a ſurgeon can do, is to put the patient into that poſture in which he finds himſelf moſt eaſy, and in this he muſt be kept until the bone be reunited; but here, on account of the number of accidents which may ariſe from the number and ſtrength of the muſcles, the utmoſt care and attention is neceſſary on the part of the operator. Blood-letting, and other antiphlogiſtic remedies, are abſolutely neceſſary, which muſt be regulated according to the circumſtances of the caſe. When the injury happens in that part of the bone which is moſt expoſed, we may ſometimes be able to reduce the fracture with our hands, and to retain the bones in their natural ſituation by proper bandages. Theſe muſt be put round the waiſt, in ſuch a manner as is moſt proper for retaining the bones in their places; but, for this, no particular direction can be given, as every difference in the ſituation of the fracture muſt require a difference in the application of the bandage. It muſt therefore be left to the judgment of the practitioner.

SECT.

## SECTION. VIII.

### *FRACTURES OF THE SCAPULA.*

This bone is more liable to be fractured than ſome of thoſe we have mentioned, though leſs than others. The fracture is not without danger, as there are inſtances of its being attended with emphyſema, which ſhows that a ſplinter had been driven in upon the lungs. There are, however, few inſtances of a fracture in its body, except it be from bullets; the part moſt ſubject to fracture is the proceſs called *acromion.* When this takes place, the arm ſinks down; and, upon examining the ſpine of the ſcapula, you will find that the acromion is ſeparated from the reſt, and a grating noiſe will be heard, particularly when you lift up the arm, The fracture is difficult to cure, and commonly leaves a ſtiffneſs, and unweildy ſenſation in the arm, if great care is not taken.

In reducing fractures of the ſcapula, we are to proceed nearly in the method recommended in fractures of the clavicles. The arm muſt be raiſed in ſuch a manner as to bring the ends of the bone into contact; a large compreſs muſt be

be put into the arm-pit, and ſecured there with a bandage tied on the oppoſite ſide of the neck; and the arm muſt be ſupported in this poſture by a napkin, in which the fore arm lies, and which is tied round the neck alſo. It is, however, difficult to ſecure the bones after they are replaced, for the portion of bone detached from the reſt is generally ſmall, ſo that frequently it is impoſſible to retain it with a bandage. A long roller, properly applied, is the beſt for this purpoſe, while the head and ſhoulders ſhould be kept raiſed, in order to relax the muſcles.

If the coracoid proceſs happen to be broken, we muſt follow exactly the ſame method of treatment as in the former caſe; but, when the neck of the ſcapula is fractured, the patient is in great danger, on account of the vicinity of the large blood-veſſels and nerves. Great care and attention muſt therefore be taken on the part of the ſurgeon, in order to put the bones in their proper places; and the utmoſt attention muſt alſo be given to prevent or allay inflammation, which is to be done by following ſtrictly the method already laid down; for, in fractures of the ſcapula, inflammation is apt to go to a greater height than in other caſes. Blood-letting, leeches, with cupping and ſcarifying, ought here to be uſed with the greateſt freedom, as well as every other remedy which has been mentioned

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in that part of this work which treats of inflammation.

## SECTION IX.

### *FRACTURES OF THE HUMERUS.*

Fractures of the humerus happen much more frequently than thoſe of the ſcapula, the bone not being thickly covered with muſcles, and being alſo very much in the way of injuries. The fracture is eaſily to be diſcovered from the violence of the pain and loſs of ſtrength, an inability to raiſe the arm, and from one end of the bone overlapping the other, if the fracture happen to be oblique. But, whether the fracture be tranſverſe or oblique, it may always be diſcovered by the grating noiſe of the bones upon one another, and the bending of the arm at ſome particular place.

Having fully aſſured ourſelves of the exiſtence of the fracture, we muſt endeavour to relax the muſcles as much as poſſible, by raiſing the arm a little from the ſide, but in ſuch a manner as neither to counteract the latiſſimus dorſi, nor pectoral muſcles. Thus, the ſurgeon, with the aſſiſtance of any of the byſtanders, may in general replace the bones; but, in every caſe, an aſſiſtant

aſſiſtant is neceſſary to ſecure the upper part of the fractured bone. This is done by laying hold of that part of the bone between the ſhoulder, joint, and fracture, while the ſurgeon keeps the fore arm bent, and gently pulls downwards, in order to adapt the bones properly to one another. After they are replaced, we muſt next ſecure them by two ſplints, either of ſtrong paſteboard, covered with ſeveral folds of fine linen, or a thin ſplint of wood, about one eighth of an inch thick, glued upon leather, and afterwards ſplit into ſmall pieces down to the leather, (ſuch as is repreſented in Pl. 1. Fig. 7.) and covered on the inſide with folds of linen or flannel. The directions formerly given about the length of ſplints muſt be here remembered. The one on the outſide of the arm muſt reach from the top of the ſhoulder to the point of the elbow, while the other reaches from the armpit to the point of the elbow on the inſide. When theſe are properly fitted, and given to the aſſiſtant to hold in the ſame poſition in which they are applied, the arm muſt be ſecured, by means of a flannel roller made as tight as is ſufficient fully to ſupport the bones in their poſition, without ſtopping or interrupting the circulation.

After having fixed the ſplints, and thus ſecured the bones, you muſt ſupport the fore arm,

as

as directed in fractures of the acromion or clavicle. In general, after the arm is properly tied up, the patient is able to ſit up, and walk about; and, as a hanging poſture is far preferable to an horizontal one for the arm, he ought, while in bed, for the firſt fourteen days, to have pillows put behind him, ſo that he may be nearly in a ſitting poſture, by which there can never be any danger of diſturbing the bones. Thus, the cure will go on ſmoothly, and without pain or uneaſineſs to the patient; but if, contrary to our expectation, a great inflammation, attended with much pain, ſhould ariſe, we muſt have recourſe to the remedies mentioned in the beginning of this chapter. But, if the ſwelling does not increaſe very much, there is no neceſſity for removing the bandage for a conſiderable time, although it is a general rule that fractures ought to be inſpected about the twelfth or thirteenth day; when, if any unfortunate accident has happened, we have it ſtill in our power to ſet matters to rights.

In fractures of the humerus, it muſt be obvious to every ſurgeon of experience, that the eighteen-tailed bandage cannot be applied with any advantage. This can only be done when the limb is in an horizontal poſture, and laid upon a pillow. In the kind of fracture we treat of, therefore, the roller muſt always be uſed;

and, if proper care is taken, the patient will commonly get well in a ſhort time. Some of my patients have uſed their arm in five or ſix weeks.

## SECTION X.

### *FRACTURES OF THE BONES OF THE FORE ARM.*

THE fore arm is compoſed of two bones, the radius and ulna; both of which, from their poſition, are conſiderably expoſed to injuries. The fracture of one or both of theſe is not uſually attended with any ſymptom that can affect the life of the patient, though, if proper care be not taken, the arm will continue ſtiff after the cure is completed, and that even when only one bone is broken. This is ſuppoſed to happen more frequently after a fracture of the radius than of the ulna; the reaſon is, that the former has a rotatory motion independent of the other, ſo that it is kept in this ſituation with more difficulty than the ulna. The ſurgeon ought therefore to be very careful that no complaint of this kind may remain, as in this caſe he will certainly be blamed for whatever happens.

Fractures of the bones of the arm are generally discovered without any difficulty. When both are broken, the case is evident, by the bending of the arm at that part where the fracture is, from the acute pain felt on moving the arm, but particularly from the grating noise which is felt on laying hold of the arm at the wrist and elbow, and then moving it backwards and forwards. It happens, however, for the most part, that only one of the bones is fractured, and this is generally the radius, probably a little above the joint of the wrist; and here a little attention will generally be necessary to discover the seat of the injury, by reason of the support given to the broken bone by the other. It may, however, be discovered by the violence of the pain, and likewise by the feel, as the bone is but thinly covered with muscles on the outside.

In fractures of the radius, the under end of the fractured bone will be found considerably depressed, the upper being raised in proportion; and, on taking hold of the wrist, and moving the bone a little, we will distinctly hear the grating of the broken part. The surgeon being thus ascertained of the existence of the fracture, whether in one or both bones, he must endeavour as well as he can to replace the ends of them in their natural situation, and keep them in

in it until they reunite. If the radius happen to be fractured, and the under part a little depreſſed, as is commonly the caſe, we muſt put the wriſt into a relaxed poſition, and bend the elbow. The patient is to be ſeated in a chair, with a table of an ordinary height before him, on which the arm is to be placed during the time of examining the fracture, as well as while it is reduced, and the bandage applied. The operation is begun by an aſſiſtant taking firm hold of the arm below the elbow joint, while the ſurgeon takes hold of it above the wriſt, taking care to preſerve it in its bended poſture. In this poſition, the arm reſting, as it were, on the ulna, the extenſion is made, by bringing it over the edge of the table nearly half way, and gently preſſing the upper part of the radius downwards, by which elevation and depreſſion, the under part will be elevated into its proper ſituation. When the bones are properly adapted to one another, we muſt then apply a ſplint, made of ſtrong paſteboard, (covered with linen or flannel, and moiſtened), to the fore part of the arm, from the bend of the joint of the elbow, along the palm of the hand to the points of the fingers. Another muſt extend from the outſide of the elbow, along the whole outſide of the arm, and back of the hand, to the points of the fingers. Theſe ought to be of ſuch a breadth

as

as nearly to meet through their whole length at the radius and ulna, and muſt now be firmly ſecured by a flannel roller, from the elbow joint to the points of the fingers. There is no neceſſity for comprehending the thumb in this bandage. After the ſplints are applied, we muſt ſuſpend the arm, as directed in fractures of the humerus, clavicle; &c. and the arm may now and then be laid upon a pillow placed on a table, or even on the patient's lap.

We muſt purſue the ſame method where both bones of the arm are boken, always taking care to put the limb in ſuch a poſture that the muſcles may be as much relaxed as poſſible, and in which their action is the leaſt. It muſt be obvious to every ſurgeon, who attends at all to the ſubject, that the deſign of the ſplints is merely to counteract, in ſome degree, the muſcular force, in order to prevent the bones from being drawn out of their places by it. To accompliſh this purpoſe, therefore, in the preſent caſe, we muſt apply the ſplints to the fore and back parts of the arm, inſtead of applying them along the courſe of the ulna and radius. Thus, the force, not only of the flexor and extenſor muſcles, will be more effectually reſiſted, but that of the quadratus, pronator, teres, &c. will be completely counteracted. It frequently happens, however, that a fracture of the radius, near the wriſt, has

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a tendency to burſt the ligament by which the ulna is connected with it, and, in ſpite of every art that can be uſed, leaves a deformity after the cure is completed. As this may happen under the care of the beſt practitioners, it is proper for the ſurgeon always to inform his patient of the poſſibility of the accident, that he may not incur any blame in caſe it ſhould actually happen. Caſes of this kind are always attended with great pain, heat, ſwelling, and tenſion, which muſt be treated in the manner formerly mentioned.

When the olecranon is fractured, or ſeparated from the ulna, we can do nothing but fix the arm in an extended poſture, with a broad ſplint laid along from the middle of the humerus to the ends of the fingers, ſecuring the whole with a roller. The arm is afterwards to be allowed to hang down by his ſide, or it muſt be laid upon a pillow when he is in bed; and, in ten days, it will be neceſſary to remove the bandage, and cauſe the patient uſe the joint a little. It ought then to be unlooſed and moved every ſecond day, bending the fore arm more and more every time; and, during the whole of the cure, we ought to rub the joint with any kind of emollient ointment that may be thought moſt proper.

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## SECTION XI.

### *FRACTURES OF THE BONES OF THE WRIST, HANDS, AND FINGERS.*

THESE bones, though frequently diſplaced, are very ſeldom fractured, except by ſhot, or the wheels of heavy carriages paſſing over them. This is owing to their ſhape and ſize, and likewiſe to their particular conſtruction; for, being ſmall, round, and very ſtrong, they ſlip out of their places with much leſs force than is ſufficient to break them. Being ſurrounded, however, by a number of tendons, membranes, and ligaments, theſe violent injuries are commonly attended with violent inflammation, ending at laſt in a complete anchyloſis or ſtiffneſs of the joint. Theſe ſymptoms are moſt effectually moderated by plentiful topical blood-letting, by means of leeches, and continued as the urgency of the caſe may ſeem to require, or as the ſtrength of the patient can bear it. In many caſes of this kind, I have, in the courſe of twelve hours, applied forty-eight leeches to the wriſt and hand to the great relief of the patient; and in no caſe

caſe that ever fell under my care do I remember to have applied fewer than twenty, as well as in a multitude of others originating from ſprains and bruiſes, in all of which I adhered ſtrictly to the method of applying leeches as long as the pain, tenſion, and ſwelling, continued violent; and ſuch was the ſucceſs with which this method was attended, that I do not recollect of any one inſtance in which the patient did not ſleep ſoundly the third night without any opiate; after this, a ſtrong ſolution of ſugar of lead will always take off the remainder of the pain and tenſion. In ſome caſes, the utmoſt care and expedition is requiſite to prevent a ſuppuration, or white ſwelling of the wriſt, as it is called; and this can only be done during the firſt four or five days after the injury is received; neither can it be done at all in any other way than that which has been already mentioned.

Having abated the violence of the ſymptoms in the way juſt mentioned, the hand and wriſt ought to be ſupported by ſplints, as in fractures of the fore arm, and ſlung in a ſimilar manner.

Fractures of the metacarpal bone are eaſily reduced, and ought to be ſecured by a firm ſplint of paſteboard, extending from the points of the fingers to the elbow joint, to keep the hand as much extended as poſſible, becauſe any motion

motion of the fingers would probably diſplace the bones. The whole is to be ſecured by a roller.

The bones of the fingers, when broken, are very eaſily reduced; and, after the operation, are to be ſecured by a paſteboard ſplint fitted to the finger, and moiſtened with water, applying a narrow roller. For the greater ſecurity, the palm of the hand and fingers ought to be ſtretched on another ſplint of paſteboard or wood, reaching nearly the length of the fore arm, which is alſo to be kept on by a roller. Having kept them in this poſture for twelve or fourteen days, the ſplints muſt be removed, and the joints of the fingers uſed, as directed in fractures of the metacarpal bones, and this ought to be done every ſecond day. In about three weeks the ſplints may be entirely removed.

## SECTION XII.

### *FRACTURES OF THE THIGH-BONE.*

THOUGH this bone is very ſtrong, yet, by reaſon of its ſituation, being very much expoſed to injuries, it is frequently ſubject to fractures, moſt frequently in its middle, and often in that part

called the neck, and next to theſe about four inches above the knee. As it is covered with very thick and ſtrong muſcles, which act as cuſhions to defend the part from blows, &c. it is evident that a fracture cannot take place from a blow, without violent contuſion of the ſoft parts, which muſt be attended with proportionable pain and inflammation; which, added to the ſtrength of the muſcles themſelves, muſt ſometimes render fractures of this bone difficult of cure.

When the bone happens to be broke below its middle, the fracture may, for the moſt part, be eaſily diſtinguiſhed, by the total inability to move the limb; and, if the fracture is tranſverſe, the grating of the bones will be diſtinctly felt, on making the ends of them rub againſt one another. In this kind of fracture, there is always a ſevere pain, accompanied with ſome degree of tenſion; but, when it is oblique, the limb is alſo ſhortened, the pain more ſevere, with a very ſenſible grating of the bones on the ſmalleſt motion, the tenſion being likewiſe augmented in proportion to the pain. In ſome inſtances, I have known the limb ſhortened by four inches where the fracture was oblique; and, even in tranſverſe fractures, the ends of the bones ſometimes ſlip paſt one another; in

which caſe a ſimilar diminution in the length of the limb will take place, though we ſeldom obſerve this, except in oblique fractures.

But, when the bone happens to be broken near its neck, the diſcovery becomes more difficult, eſpecially in ſtrong and muſcular patients. In theſe, the injury is apt to be confounded with a diſlocation of the femur at its upper extremity. By accurate obſervation, however, it is poſſible to diſtinguiſh a fracture from this diſlocation. In the former, the pain about the joint is very acute on the ſmalleſt motion, the whole limb is looſe and moveable, and the foot may almoſt be turned round by the ſurgeon with eaſe; during which motion a grating of the bones will be diſtinctly felt. The limb, at the ſame time, is conſiderably ſhortened by the contraction of the muſcles, and the trochanter will be found conſiderably higher than in its natural ſtate. In luxations of this bone, the ſymptoms are quite reverſed; for, as the acetabulum is naturally deeper above than below, it thence happens that the head of the bone is much more frequently forced inwards and downwards, than outwards and upwards, reſting for the moſt part in the thyroid hole. Hence, the limb, inſtead of being ſhortened, is lengthened; and the trochanter being much lower down than in its natural ſituation, muſt be eaſily diſtinguiſhed

tinguiſhed by accurate examination and compariſon with the other, as well as by examining the thyroid hole from the groin, where the head of the bone will be felt, while, at the ſame time, there is an evident chaſm oppoſite to the acetabulum. Beſides the increaſe of length in the limb juſt mentioned, the foot, in luxations of the upper joint of the thigh, is always turned out, and cannot be brought into its natural poſition; neither is the pain, in caſes of luxation, equally intenſe as in caſes of fracture.

Thus we may, at all times, diſcover a fracture of the thigh-bone, and diſtinguiſh it from any other accident; but, in all fractures of this kind, the cure is difficult, and therefore the ſurgeon ought not to be too haſty in forming a prognoſis. This difficulty ariſes from the thickneſs of the muſcles which cover the bone, ſo that the ſurgeon is often liable to miſtake the direction of the fracture, and for the ſame reaſon he is alſo frequently uncertain whether the bones are properly replaced or not. It is likewiſe very difficult to retain the bones in their ſituation after they are replaced. The reaſons of this are, 1. The thickneſs and ſtrength of the muſcles already mentioned, by which means, eſpecially if the fracture be near the head of the bones, it is very liable to be diſplaced without any accident whatever. 2. If to this natural action of the muſcles

muſcles we ſuperadd any bodily exertion, which perhaps cannot be avoided, as coughing or the like, the danger of diſplacing the bones muſt thereby be augmented in proportion; and, 3. It is impoſſible to regulate the poſture of the patient's body with ſuch accuracy as that the bones, always in danger from the natural action of the muſcles, may not be diſplaced by the leaſt unavoidable motion.

From theſe cauſes, we often meet with deformed limbs where the thigh-bone has been broke, the broken limb being commonly ſhorter than the other. For this, the ſurgeon is apt to be blamed, and ought therefore to inform his patient that ſuch accidents may happen, which it is not in the power of any perſon to prevent. Mr Pott is of opinion, that the deformity, which ſo often takes place after fractures of the thigh, is principally owing to the limb having been put in a ſtraight poſition, by which the muſcles are ſtimulated to action; and, on the principle already laid down, this muſt undoubtedly be the caſe; for, as the bones are in danger of being diſplaced by the natural action of the muſcles, if theſe are ſtimulated by extraordinary means to act beyond what they do naturally, the danger will be the greater. Such a poſition, therefore, ought to be choſen for the limb, as will moſt

moſt effectually relax the muſcles, and ſuch we have already deſcribed.

When a fracture of the thigh is to be reduced, the patient muſt be laid upon his back, on a bed made in the manner formerly deſcribed, with the knee bended, and reſting on the foot. An aſſiſtant then lays hold of the upper part of the thigh, immediately above the fracture, whilſt the ſurgeon takes firm hold of the under part of the bone juſt above the condyles, the muſcles being all relaxed, by bending the knee as formerly directed. The ends of the bones muſt now be placed oppoſite to one another; but, in ſtrong muſcular patients, this is attended with ſome difficulty, and a conſiderable degree of extenſion is neceſſary. This, however, can only be done by the ſurgeon, for the aſſiſtant's buſineſs is only to keep the limb firm, and to prevent the patient from being pulled out of bed. The ſurgeon will know when the ends of the bones are properly replaced, by feeling them lengthen, and give a kind of jerk, or ſtrong grating rub, at the inſtant of their contact; and, after he has put them in this poſition, he muſt ſtill hold the limb firm with his right hand where he firſt laid hold of it, and, with his left hand now he is to examine the bones at the fractured part. This muſt be done with the utmoſt care and accuracy, ſo that he may be perfectly

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ſatisfied that the ends of them are fitted to each other, and that no membrane or any other ſubſtance has got between them. Having then fully aſcertained their exact ſituation, and that they are properly fitted to one another, we muſt apply the ſplints, repreſented Pl. 1. Fig. 6. the firſt to the outſide, which muſt extend on that ſide from the trochanter to four inches below the knee, while the other is placed in like manner on the inſide from the groin to the knee; after which, they are to be ſecured by ſeveral circular bandages as firmly as poſſible, but without impeding the circulation. The ſplints ought always, as has been already mentioned, to be covered with flannel or linen; and, if the bed be made according to the directions already given, it will of itſelf anſwer every purpoſe, without any pillow or other ſupport.

After the reduction of the fracture is accompliſhed, the patient muſt ſtill lie on his back, with the head and ſhoulders a little raiſed, and thus the muſcles that move the thigh, as well as thoſe that move the leg, are relaxed. Thus, alſo the cure will go on proſperouſly, ſo that, in the courſe of fourteen days, the patient may be raiſed a little farther with great advantage. The eighteen-tailed bandage, or one ſimilar to it, will apply more eaſily, and fit more tightly to the limb than any other; and, as no motion is neceſſary in applying it, if any accident ſhould

happen which might make it requiſite to unlooſe the limb, this can always be done without diſturbing the limb in the leaſt. In general, all the bandages may be unlooſed in five weeks, and in ſix the patient may be allowed to uſe the limb.

The method of cure juſt now laid down will ſucceed, we may ſay, in ninety-nine caſes of an hundred of tranſverſe fractures; and, even in a great many of thoſe which are oblique, but in thoſe which are very oblique, it will not by any means anſwer. Hence, a great many bandages, and machines of different kinds, have been invented by different practitioners, as Hildanus, Belloy, Gooch, &c.; but the contrivance of Mr Gooch ſeems preferable to any of the others; for the ſplint of Hildanus, and the mechanical bandage of Belloy, always keep the limb in an extended poſture, and conſequently ſubject the patient to the danger of having the fracture diſplaced, as has been already mentioned; and, for this reaſon, the preſent improved practice of ſurgery accounts them inadmiſſible. Mr Gooch's machine conſiſts of three jointed circular bars, one of them adapted to the upper part of the thigh, while the other two are connected together, and the one to be fixed immediately above the joint of the knee, the other being fixed below it. Theſe are connected by ſtrong metal ſplints, one on the inſide, and the other on the outſide of

of the thigh; and theſe are ſo contrived, that, by turning the under end, which is connected with a plate in the circular bar immediately above the knee, in the form of a ſcrew, they are elongated. But, though this machine is greatly preferable to thoſe of Hildanus and Belloy, and, though it has the approbation of ſuch a reſpectable name as Mr Pott, it is certain that it will not anſwer the purpoſe in ſevere compound fractures, on account of its want of force, and from the poſition of the upper circular, which is fixed on the ſoft parts over the top of the thigh. Hence, if much force is uſed to ſcrew the parts very firm, ſo that the limb may be kept in as extended a ſituation as poſſible, there is great danger of ſtopping the circulation, not only in the great veſſels themſelves, but likewiſe in their branches, and thus throughout the whole limb, by which means great pain, inflammation, and ſwelling, muſt undoubtedly take place, which may perhaps end in gangrene itſelf; and even the author himſelf acknowledges that great care muſt be taken to prevent too great preſſure on the inſide of the thigh, ſo that his invention ſeems ſtill inferior to that of the late Dr Aitken of Edinburgh. This inſtrument is repreſented in Pl. 2. Fig. 1. and that of Mr Gooch Pl. 3. Fig. 1. to ſhew the difference betwixt them.

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Dr Aitken's machine is compoſed of two circular belts, made of the thickeſt ſadle leather, the breadth of the upper one which goes round the pelvis being about three or four inches. In one end of it are three or four ſtuds, having as many holes correſponding to them in the other, and by theſe it is faſtened round the body. There are ſeveral rows of theſe holes placed at ſmall diſtances behind each other for the purpoſe of tightening the belt, which may thus be eaſily adapted to people of different ſizes. On the inſide it is covered with a flexible thin iron plate, ſuch as is uſed at times by tin-plate workers. There are two joints oppoſite to the os ſacrum which open in ſuch a manner as to allow it to ſurround the body without hurting the perſon; and, above this plate, it is lined with the ſofteſt buff or ſhamoy leather, having a thin layer of fine hair or wool interpoſed betwixt the two. This lining ought to project over the edges of the belt at leaſt half an inch, to prevent the ſkin from being in any degree chafed; and the lining is ſtitched to the edges of the leather belt, to which the iron plate does not extend.

Inſtead of having the opening of this machine immediately above the pubes, it will be eligible to have it on one ſide; and, on applying it, in order to prevent its moving upwards, (for there is no danger of its moving downward, as both

the ſhape of the pelvis, and the preſſure from below, prevent it), there muſt be two ſtuffed ſtraps fixed to its back part, and paſſing through between the thighs from behind, to be tied by their double ends to the fore part of the belt. Theſe ought to be ſtrong, as well as ſoft, that they may reſiſt the action of the muſcles of the thigh. If, during the cure, they at any time ſit uneaſy, we muſt inſert a piece of ſoft cloth or fine tow between them and the ſkin, in order to keep the ſkin from being chafed.

From this deſcription of the upper circular, it is evident that it occupies the place of the rupture-bandage exactly, and acts almoſt in the ſame manner; with this difference only, that it is tied with two thick ſtraps upon the pelvis, and that the circular belt is much broader, as well as more thin; from all which it is evident that the patient is much leſs incommoded when lying on his back, and the preſſure from below is much more effectually, as well as very eaſily reſiſted.

The ſmaller circular is exactly ſimilar to the large one in its external ſtructure. It is made of ſaddle leather, which muſt be covered within, according to the directions already given, only it is not neceſſary to uſe any plate of iron. It is applied immediately above the joint of the knee, juſt at the place where the garter is tied, and

and with nearly the ſame tightneſs; but, if the belt is thought not to be ſufficiently ſoft, we may wrap ſome folds of flannel round the thigh below it. The ſurgeon ought to have at hand three or four ſteel ſplints of a length ſufficient to extend from the upper circular to the lower one, and to project over it about two inches and an half. Theſe ſhould be about five eighths of an inch broad, and three ſixteenths of an inch thick; according to which dimenſions, they will have ſtrength ſufficient to reſiſt every effort of the muſcles that may tend to ſhorten the fractured limb, or derange the bones, while they are at the ſame time ſo flexible that they can be eaſily bent with the hand to any degree of curvature the ſurgeon thinks proper. Theſe ſplints, having two fixed points, may be kept at proper diſtances from each other, ſo that, by their means, we may have every advantage we can ſuppoſe to be derivable from extenſion; the poſition of the bones will be fully preſerved, and the muſcles will be kept in a proper degree of relaxation.

In the head of each ſplint is a ſlit of about half an inch in length, and an eighth of an inch broad, to receive the head of a ſtud furniſhed with a ſhoulder, which is fixed in the upper bandage, but in ſuch a manner as to be at liberty to turn round its axis, by which means the

ſplints

ſplints themſelves are fixed. At the lower end, theſe ſplints paſs through an arched plate, firmly rivetted to the bandage, and in which there is an iron ſcrew, with a flat broad head, to enable the operator to turn it eaſily with his finger and thumb. This muſt be fitted to one or other of the depreſſions made on purpoſe at ſmall intervals in the ſplints; and thus it is evident that the diſtance between the two circulars may be regulated with great accuracy at the pleaſure of the ſurgeon, and may afterwards be firmly kept in the poſition which has been choſen. It is likewiſe evident, that, by the application of ſeveral ſuch ſplints, (viz. one upon the inſide, from the os pubis to the internal condyle of the knee or thigh-bone, another from the anterior ſpine of the os ilium to the point immediately above the patella, and a third a little above, and behind the acetabulum, to the external and back part of the thigh immediately behind the external condyle. Thus, the parts will generally be completely ſupported; and if, at any time, more ſhould be neceſſary, they may be applied in the intermediate ſpaces betwixt the others. Theſe, it is evident, muſt, almoſt irreſiſtibly, oppoſe that action of the muſcles which tends to diſplace the bones, even though the r tende.c, o action be augmented by any ordinary ſtimulus, at the ſame time that the

the ſplints are eaſily dilatable in any direction laterally.

By a proper application of this inſtrument, every motion of the upper joint of the thigh is ſuppreſſed; and, as there is not occaſion for any bandage, if we find it neceſſary to apply any thing elſe, as leeches, preparations of lead, &c. or to uſe cupping or ſcarifying, or where a wound requires frequent dreſſing, we may eaſily accompliſh all theſe purpoſes by making the ſplint bend outward like an arch, by raiſing it gently with the hand towards you. In every caſe, therefore, of fracture of the thigh-bone, or even of its neck, whether tranſverſe, oblique, or compound, we may with eaſe reduce the bones, and keep them in their poper poſition till they unite; and every neceſſary application may be made with eaſe during the time of the cure.

When the limb is ſecured in the manner above directed, the patient may be either placed on his back, with his head and ſhoulders a little raiſed, or he may be turned a little to the affected ſide; and, in caſes where this machine is uſed, we have nothing to do but to adapt it properly, and to uſe every method in our power to prevent inflammation and its conſequences. Should the limb ever be attacked by an involuntary ſtarting, which is ſometimes the caſe, it may be faſtened to the bed by ſtraps; but even

here

here there can never be the leaſt poſſibility of putting the bones out of their places, on account of the force with which the machine keeps them in their proper poſition. Here alſo it muſt be obvious, that the leaſt alteration in the poſture, or ſize of the limb, muſt at once be obſerved; and there will not be any occaſion for the patient to have the machine moved, as in caſes where the ſplints and bandages are uſed. It is likewiſe obvious, that, by raiſing the bed on which the leg and thigh are placed, as has been already directed, having the head and ſhoulders likewiſe a little raiſed, reſting the leg alſo, as it were, on the ſole of the foot, the patient will be much ſooner able to ſhift his poſture a little, when the ſurgeon manages the limb, than when the ſplints and bandages are made uſe of; becauſe, in this way, both the haunch and knee joints will be relaxed ſufficiently; though caution muſt likewiſe be uſed, both by ſurgeon and patient, when this machine is made uſe of, as well as when the common ſplints are uſed.

By an inſtrument of this kind, we may overcome the difficulties which, in the reduction of oblique fractures, have baffled the ſkill of the moſt expert ſurgeons, and the limb reſtored to its priſtine ſhape, without any of thoſe diſagreeable ſymptoms which ſo frequently take place when

when only ſplints and bandages are uſed. In ſuch caſes, where the bones could not be retained in the ordinary way, I have ſeen the femoral artery deſtroyed by its own friction upon the internal edge of the upper part of the thigh-bone, by which an aneuriſm very much diffuſed, as well as of conſiderable ſize, was produced. In this caſe, however, it is evident, that, if a machine of the kind juſt now deſcribed had been made uſe of, the bones could not have paſſed one another in ſuch a manner. In all caſes where much pain, inflammation, and ſwelling, have taken place, before the ſurgeon was called, the patient ſhould be put to bed, with his limb bent in ſuch a manner as to relax the muſcles of the thigh, with the limb laid upon a pillow, extending from the top of the thigh to the joint of the knee, and kept firmly in its place, the leg being placed on another in ſuch a manner as to give the patient the leaſt pain we can; and he will always find himſelf moſt eaſy when the thigh and leg are placed on their outſides. A number of leeches muſt now be applied, in proportion to the urgency of the ſymptoms, and an emollient poultice to promote the diſcharge from the wounds. The leeches and poultice muſt be repeated every day, and, in young robuſt people, a pound of blood muſt be taken from the arm. When theſe evacuations have taken place, the

ſwelled

ſwelled place ought to be covered with cloths, wetted in a ſolution of ſugar of lead, which muſt alſo be frequently repeated, until the ſwelling is abated. The bowels muſt then be kept open by emollient clyſters, or a doſe of ſoda phoſphorata, as ſoon as the ſwelling, tenſion, and pain, are relieved. The bones muſt be replaced exactly, and kept in their places, by the above deſcribed machine, until they are united.

## SECTION XIII.

### *FRACTURES OF THE PATELLA.*

THIS bone is ſo ſituated that fractures of it ſeldom happen; and, indeed, it is naturally ſo ſtrong, that it cannot be broken without a very violent blow. Inſtances, however, occur of its being broken both in a tranſverſe and longitudinal direction, or even of its being broken into ſeveral pieces. Such kind of fractures have been accounted very dangerous, on account of their being apt to leave a ſtiffneſs of the joint, owing, as has been ſuppoſed, to the formation of the callus in too great quantity, and its finding acceſs to the cavity of the joint. In all my practice, however, I have not met with a ſingle in-

ſtance of ſtiffneſs of the joint from a fractured patella, ſo that I cannot help concluding this opinion to be erroneous, as is certainly the caſe with that about the ſuperabundance of callus. So far is the callus from being ſuperabundant in fractures of the patella, that it is not, for the moſt part, united by callus at all, but rather by a kind of ligamentous ſubſtance of a flexible nature. This muſt always be in proportion to the diſtance of fragments from one another during the time of the cure; for, in order to accompliſh a cure in tranſverſe fractures of this bone, we are told that it is not neceſſary that the broken bones here ſhould be brought into contact, as in other caſes; on the contrary, there are inſtances of cures being performed where they could not be brought within an inch of one another. But, in caſes of this kind, although the patient may, in the courſe of a few weeks, be able to walk about eaſily upon any ſmooth place without danger of ſtumbling, he will find it quite different when he attempts to go down any declivity, on account of the relaxation of the ligamentous ſubſtance interpoſed betwixt the bones, and which is, on occaſion of any exertion, apt to give way. If the knee, indeed, is kept extended for a length of time, as eight, ten, or twelve weeks, the joint may become ſtiff; but this is only the effect of wrong management on the part of the

furgeon, and has been unjuſtly imputed to the nature of the fracture itſelf.

Longitudinal fractures of the patella are very rare, but tranſverſe ones by no means uncommon; and, in many caſes, the portion of bone attached to the extenſor muſcles is ſo ſmall, that there is much difficulty in retaining the parts in their proper place after a reduction is made. In other caſes, I have ſeen the patella divided tranſverſely into three or more pieces. Accidents of this kind may be occaſioned by bruiſes, or falls from conſiderable heights.

An extended poſture of the limb is neceſſary in fractures of the patella; for, as this bone is connected only with the extenſor muſcles of the leg, by extending the limb we put theſe into a ſtate of relaxation. The firſt thing the ſurgeon has to do, when called to a patient with a fractured patella, is to take care that the bed be properly made. This ought to be made ſo firm, that there may be no occaſion for moving the patient for eighteen days at leaſt. The patient is then to be put into it, and a broad flexible ſplint, made of wood covered with leather, as formerly mentioned, provided for the purpoſe. This muſt reach along the whole back part of the thigh, leg, and ancle, from below the tuberoſity of the os iſchium to the top of the heel. Beſides the covering of leather already mentioned,

ed, it will likewiſe be abſolutely neceſſary that the whole of this ſplint be lined with ſoft wool or cotton. It muſt be firmly faſtened upon the limb at the ancle, and a little below the knee, with two circular bandages; and, in the ſame manner, upon the thigh, a little above the joint of the knee, and in the groin near the upper thigh-joint. The limb being thus ſtretched and ſecured, we are, with both hands, to bring the parts of the fractured patella as near to one another as we can; and, in this poſition, we muſt leave them for ſome time, that we may have an opportunity of applying leeches and other remedies for inflammation, which here, as in all other nervous or ligamentous parts, is greatly to be dreaded; and, while there remains any degree either of ſwelling, pain, or tenſion, we cannot apply a bandage with any degree of propropriety; nor can we even do ſo while there is good reaſon to believe that they will come on. We muſt then endeavour, with proper bandages, to retain the bones in the beſt poſition in which we have been able to place them. If, however, upon examination, the bones are found to remain of themſelves in the poſition in which we have placed them, no bandage will then be neceſſary, but the joint muſt be kept moiſt with cloth, moiſtened in the ſaturnine water, or equal parts of vinegar and water, or a mixture of one pound

pound of vinegar, with as much water, and three drachms of sal ammoniac, will be found very advantageous. After the first three weeks, however, the whole anterior part of the knee joint may be covered with a pledget of Goulard's cerate, and the joint gradually bended.

In longitudinal fractures of the patella, the bones are easily replaced; and if, after all the symptoms of inflammation are removed, we find that there is any occasion for a bandage, we may very easily retain the bones, by adhesive straps drawn across the joint, which will not only bring the bones into contact with each other, but retain them in their places with the greatest ease. It must, however, be obvious to every person who thinks on the subject with attention, that, in a transverse fracture of the patella, where the bones separate from one another to a considerable distance, nothing of this kind can be of any use, even in preserving them in their position. Writers on surgery, indeed, have asserted, that there is no necessity for the bones being in contact to form a complete cure; but, if this be the case, I cannot understand why nature has furnished us with so strong a bone in this place. Certainly it must be designed for resisting violent injuries, which it never can do, if the parts of it are separated to any distance from one another; nor can I believe, that, in

any

any cafe of this kind, there is a poſſibility of another kind of cure than that already deſcribed. Several inſtances have fallen under my own obſervation, in which I have had reaſon to believe that the patients were treated in this way. In all of them the fragments of the patella are evidently ſeparated to a conſiderable diſtance; but, although in three of theſe the patients can walk pretty freely on a plain ſurface, they dare not attempt to bend their knees, almoſt in the leaſt, for fear of falling, ſo that I cannot help being of opinion that it is an advantage for the patient to have the bones placed as near each other as poſſible, and kept ſo during the whole time of the cure.

From what has been already laid down, it muſt alſo be evident, that the more firmly the pieces of broken patella are cemented by callus, the more complete the cure muſt prove at laſt, ſo that every effort ought to be uſed to bring them together; for, if nature had not intended that, by means of the patella, the joint ſhould have a free and eaſy motion, why might not the tendon of the rectus muſcle have been inſerted into the tibia, without the intervention of any bone whatever.

Pl. 2. Fig. 7. 8. ſhews a bandage, which, I apprehend, muſt generally be found ſerviceable in caſes of fractured patella. It conſiſts of two circular

circular ſtraps, A, B, made of ſtrong leather, and thinly buffed with fine ſhamoy. C, E, are two perpendicular ſtraps, paſſing at right angles between the other two; and exactly in the middle between theſe are two ſemilunar compreſſes made of fine cork, marked *d*; over which, another ſtrap, ſomewhat longer, is faſtened by a buckle F. The ſplint being removed from the back of the thigh, in doing which great caution is to be uſed, and the bones replaced. If they have been diſplaced, the ſtrap A is to be applied below the joint, and under edge of the patella, in ſuch a manner as to ſupport it in its natural ſituation, without ſtraining it farther upwards, and is to be drawn no tighter than the patient can eaſily bear it. After this, having adjuſted all the ſuperior part of the bones, and brought them into contact, or as near as poſſible to one another, the ſtrap B, on which, as well as on A, there is a ſemilunar compreſs, muſt be applied immediately above the knee joint, and, in ſuch a manner, that both compreſſes may act immediately upon the edges of the fractured bone, one above, and the other below the ſtrap A. This circular muſt now be buckled pretty firmly; after which, we have it in our power, by pulling the two perpendicular ſtraps that come down on each ſide of the patella, to bring the upper circular and compreſs nearer the under one;

one; and thus the upper parts of the fractured bones will be brought into contact, and kept ſo. This, however, will be moſt completely effected, by making the ſtrap F firm, by the buckle fixed to the circular immediately above the knee. This ſtrap paſſes over the centre of the rotulla, and draws downward the compreſs previouſly applied. Thus, it is plain that all parts of the fractured bone may be brought into contact, and firmly ſecured; but care muſt always be taken, that, by tightening the ſtraps too much, we do not induce inflammation, pain, or ſwelling, which, as has formerly been obſerved, are very apt to occur in fractures of the patella, and are very dangerous.

Having fixed the bandage in the manner juſt now directed, it will ſtill be proper to keep the leg extended, as formerly, upon the ſplint, till we have reaſon to believe that the bones are united with ſufficient firmneſs to allow the joint to be gently bended twice or thrice every day; and, for the moſt part, this may always be attempted about the eighteenth or twentieth day from the accident. Before this, the callus is too ſoft, ſo that any attempt to move the joint muſt do hurt, by weakening the union which has begun to take place between the broken bones. It will even be adviſeable, for ſome weeks after

the cure ſeems to be completed, to make uſe of the bandage, that we may be ſure that all the parts have acquired their due degree of firmneſs and ſtrength.

In thoſe caſes where the tendon is ſeparated from the patella, the former will alway retract very much; but as, in theſe, no part of the bone is attached to the tendon, our bandage cannot be of any uſe, but muſt rather prove injurious, by preſſing down the end of the ruptured place too ſtrongly upon the thigh-bone. We have nothing, therefore, to depend upon in theſe caſes, but the ſame extenſion which has been already directed in fractures of the patella. We cannot, therefore, promiſe always to bring the bone and tendon exactly into contact, ſo that a proper callus may be formed; yet, in general, the ligamentous ſubſtance formerly mentioned, which unites the broken pieces, will acquire ſuch a degree of firmneſs, as will enable the patient to uſe the joint with tolerable eaſe and ſafety.

SECT.

## SECTION XIV.

### *FRACTURES OF THE BONES OF THE LEG.*

As in this limb there are two bones, one of which ſupports the other, fractures are not very dangerous or difficult of cure, when only one of them is broken, which indeed moſt frequently happens. The fibula, being the weaker of the two, generally ſuffers, and may readily break by any falſe ſtep, where the foot is turned outwards, and the under end of the tibia a little inwards, by which motion the ancle is in danger of being diſlocated. The part where it gives way is generally two or three inches at moſt above the ancle joint; and, where this happens to be the caſe, as the parts of the bone are kept in their places, by the tibia remaining whole, nothing remains to be done by the ſurgeon, but to prevent or remove the inflammatory ſymptoms, and to give the limb reſt for ſome days, with the muſcles in a relaxed poſture.

Sometimes the tibia is fractured, while the fibula remains whole; in which caſe, the latter will ſerve as a ſupport to the broken bone bet-

ter than any ſplint we can uſe. The leg and foot are to be placed upon a pillow, with the muſcles properly relaxed, while the ſurgeon daily examines the poſition of the limb, leſt the foot and ankle ſhould be too much depreſſed by the thinneſs of the under end of the pillow, and the toe turned outwards too much. In violent injuries, however, a fracture of both bones is much more frequent than that of any one of them ſingly; and this kind of fracture generally takes place about two inches and an half, three, or four inches, above the ancle. When both are fractured, it moſt frequently happens that the broken ends of the under parts are, by the action of the muſcles, forced backwards under the upper parts of the bone, the end of which now preſents that phenomenon formerly taken notice of, and which has occaſioned ſo many miſtakes, viz. the *riſing end of a broken bone.* This has been already treated of ſo fully, and ſhown to ariſe from the action of the muſcles which here lie all on the back part of the leg, that no more need be ſaid about it. When it does not take place, both ends of the bone project outward, and the leg is very much bent. This alſo is the effect of the ſtrong action of the muſcles inſerted into the os calcis, which pull the heel and foot backwards and upwards, ſo that a conſiderable bend in the leg muſt neceſ-

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farily take place; yet, even in this ſituation, the upper part of the bone will project ſomewhat above the lower one. As, therefore, both the bend of the leg, and the projection of the bone, are owing to the ſame cauſe, ſo, if either of theſe ſymptoms continues during the cure, it muſt be imputed to the careleſſneſs or ignorance of the ſurgeon in not adapting the broken ends of the bone properly to one another. Indeed nothing can more plainly demonſtrate the ignorance of a ſurgeon than his attempting to keep down the riſing end of the bone, as he terms it, by compreſs and bandage; for thus, inſtead of doing any good, the ſkin is often completely deſtroyed by ſphacelus, and a ſimple fracture thus changed into a compound one of the worſt kind.

As ſoon as the ſurgeon has aſſured himſelf of the exiſtence of a fracture of both bones of the leg, and carefully examined the nature of it, he muſt take care to have the patient's bed properly made, remembering, that, in theſe, as in other fractures, the muſcles muſt be relaxed as much as poſſible, which is beſt done by gently bending the knee joint, and putting the ancle joint into ſuch a ſituation, that the foot and toes may naturally aſſume the ſame poſition that they do when we ſit at eaſe upon a chair. During the whole of the cure, the foot ſhould be kept exactly

actly at a right angle with the limb, as in this position only we find that all the muscles are relaxed. Upon the slightest trial we will find, that, as soon as the foot is stretched out to any great degree, the heel is instantly brought nearer to the knee, by which means the gastrocnemii muscles are not only assisted on contracting, but solicited to do so more forcibly by the position in which the foot now is. Having therefore relaxed, as much as possible, all the muscles of the leg and foot, an assistant is to lay hold of the limb firmly immediately below the knee, while the surgeon takes hold of it near the ancle. If the upper bone projects very much, a considerable extension will be necessary. This must be performed by the surgeon in a firm and steady manner, applying, all the while, such force as is found to be requisite. During the time of the extension, much advantage will be derived from pressing the under portion of the limb backwards, by which means the anterior edges of the inferior part of the broken bone will be freed from the posterior edge of the upper part; and, when this is accomplished, the bones may then be exactly fitted to one another.

The fracture being thus reduced, a splint of wood, or strong pasteboard, with an opening to receive the ancle, must be applied on the outside of

of the limb from above the knee joint to the ſole of the foot, and another of the ſame kind upon the inſide. Theſe muſt be well ſecured by an eighteen tailed bandage, and laid upon a pillow upon its outſide, with the foot at right angles to the limb, and the great toe in an exact line with the tibia. When all theſe are properly fixed in the manner juſt directed, the cure will generally go on well, and the bones be united in three weeks ſo well, that the bandage may be unlooſed, and the limb examined, which is to be done every third day for ten days more; and then the dreſſings may be finally removed, and the patient allowed to walk about with a crutch. In thoſe caſes, however, where the patient is afflicted with ſtartings of the limb, accompanied with twitchings of the muſcles, we muſt uſe a ſplint either of tin or copper, hammered out, ſo that it may exactly fit the limb on the outſide, as is repreſented Pl. 2. Fig. 5.; and it will likewiſe frequently be of advantage to have ſuch another for the inſide, both of them being covered on the ſide which is next the limb, to a conſiderable thickneſs, with ſoft cloth or cotton. The limb is very cautiouſly to be placed in the outſide half; while, if neceſſary, the inſide half muſt likewiſe be applied, and faſtened with two ſtraps, one a little below the knee, and the other at the ancle. By theſe

the

the bones will be kept in their natural poſition; and, if the ſplints are made exactly as repreſented in the figure, nothing elſe will be neceſſary, and the patient may change his poſture much ſooner than when the bandage and ſplints are uſed.

Mr Pott takes notice of a very dangerous caſe which ſometimes occurs where the fibula is fractured, and the tibia diſlocated; and, in order the more fully to underſtand this, it will be neceſſary to take ſome notice of the anatomy of the parts. The lower extremity of the fibula deſcends conſiderably below that of the tibia, but is connected not only with it, but with the aſtragalus, which principally forms the joint of the ancles. To both theſe it is tied by very ſtrong and inelaſtic ligaments, and in the lower part is furrowed to receive the tendons of the peronæi muſcles, which are faſtened down in the furrow by ſtrong ligamentous capſules, having their action ſo determined from this point, that the ſmalleſt variation, in conſequence of external violence, diſtorts the foot conſiderably. The other motions of the foot depend alſo upon the connection of theſe bones with the gaſtrocnemii, and the reſt of the muſcles ſituated near them, which cannot act if the tibia is any way put out of its natural poſture. When both bones, therefore, are broken, and conſequently the

fibula rendered incapable of ſupporting the action of the muſcles, the whole limb is diſtorted; and, by reaſon of the depreſſion of the inferior part of the bone behind the ſuperior, and its conſequent retraction, the broken limb becomes conſiderably ſhorter than the other, which is not the caſe when either the tibia or fibula are broken ſingly. But, if the fibula be violently forced from its connection with the aſtragalus, a partial diſlocation of the ancle joint muſt always happen externally; and this cannot happen without a conſiderable extenſion, or perhaps a laceration of the burſal ligament of the joint; and not only of this, but of the ſtrong ligaments by which the lower end of the tibia is connected with the aſtragalus, or os calcis. This is the caſe when the fibula happens to be broken in its weakeſt part, within two or three inches of its lower extremity. Its lower end falls towards the tibia, which, being now deſtitute of its uſual ſupport, can no longer bear perpendicularly upon the aſtragalus. The common ligament, called the burſal, which is weak, muſt always be violently ſtretched, while the ſtrong ones are lacerated; and thus the fracture is conjoined, not only with a partial diſlocation, but frequently with a wound alſo. When this laſt accident happens to be added to the reſt, and the bone protrudes at the ſame time, there is frequently

reaſon

reaſon to dread a gangrene, which may end fatally, if the limb be not amputated. Even when there is no wound, the caſe is very troubleſome and dangerous, and requires the utmoſt ſkill of the ſurgeon to preſerve the limb in its proper ſhape. The only directions that can be given, are to lay the limb upon its outſide, bending the knee moderately, by which means all the muſcles connected with the fractured bone, or thoſe concerned with it, are relaxed, ſo that the joint may be eaſily reduced, and the foot put again into its proper poſition.

## SECTION XV.

### *FRACTURES OF THE BONES OF THE FOOT AND TOES.*

THESE bones are not very liable to fractures, though they may be ſo by very heavy weights falling upon them, carriages paſſing over them, &c.; and, in almoſt all caſes of fracture in theſe bones, the ſoft parts are violently bruiſed. Hence, there is always a very great tendency to inflammation, and all the ſkill of the ſurgeon muſt be exerted to prevent or remove it. In moſt caſes this may be eaſily done, by attending to what I have

Fig. 1

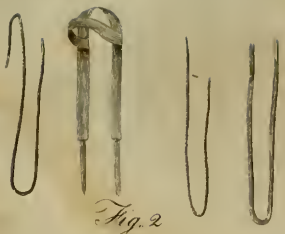

Fig. 2

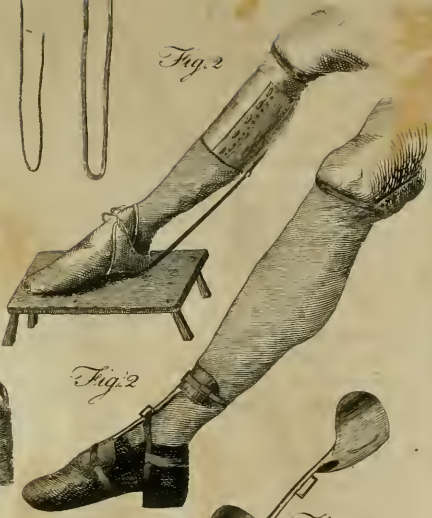

Fig. 2

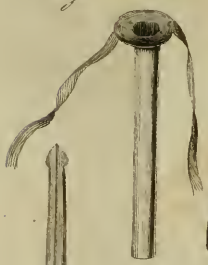

Fig. 3

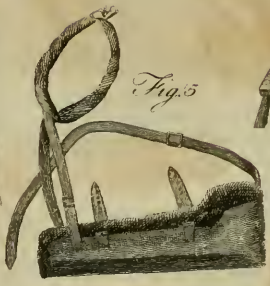

Fig. 5

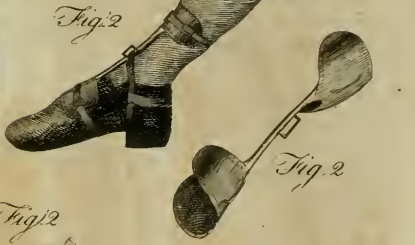

Fig. 2



Fig. 2

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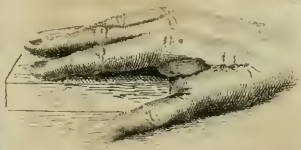
Fig. 2



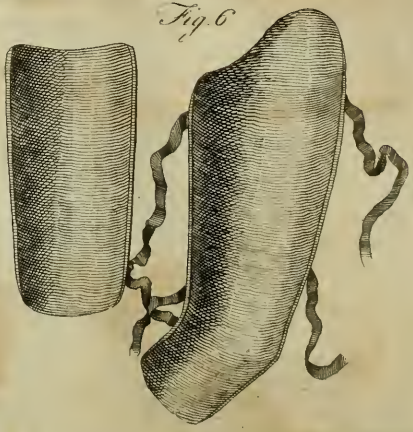


Fig. 6

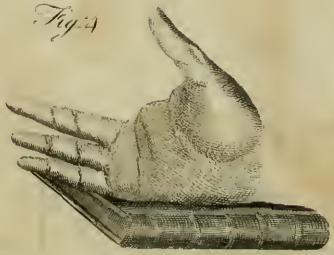


Fig. 4

have formerly ſaid upon that ſubject; after which, we are to examine the bones, and replace them in their natural poſition as well as we can, remembering always that the true diſtinguiſhing ſign of a fracture is the grating of the ends of the bone upon one another. We muſt then apply a large ſplint exactly of the ſize of the ſole of the foot, and lined with ſoft wool or flannel. This muſt be kept on, by a roller put round the foot and ancle; after which, the foot is to be laid upon a pillow, and kept free from motion. The ſurgeon muſt alſo carefully watch the patient, and obviate the very firſt appearance of unfavourable ſymptoms; for here, by reaſon of the exceſſive contuſion, and bruiſing of the ſoft parts, the moſt violent inflammation, terminating in gangrene, is apt to take place.

## SECTION XVI.

### *OF COMPOUND FRACTURES.*

A compound fracture has already been defined, that in which the breaking of a bone is complicated with a wound in the integuments. It may happen at the ſame time with the accident itſelf,

when, by the violence of the injury, the end of the bone is forced through the ſkin; or it may be the effect of miſmanagement afterwards, as when a ſurgeon, through miſtake, attempts to preſs down the *riſing end* of a broken bone. But, from whatever cauſe it happens, the danger is always exceedingly great, and the patient very frequently dies. This fatal termination, however, is in many caſes to be aſcribed leſs to the nature of the injury itſelf, than to the injudicious method of treating it. The method generally practiſed at preſent is, in the firſt place, to ſaw away the protruding part of the bone, if there is any ſuch; and, in order to do this, it is neceſſary to introduce a piece of paſteboard or leather between the ſkin and under ſide of the bone; after which, the patient muſt be put to bed, and the limb placed upon a pillow. The wound is then ſuperficially dreſſed with a pledget ſpread with ointment; a few leeches being commonly applied near the wound, and their diſcharge promoted by a warm cloth dipped in hot water, and then wrung out. Cloths, dipped in a ſolution of ſugar of lead, are put on after the diſcharge ceaſes. By the diſturbance occaſioned in ſawing off the piece of bone, the inflammation in the wounded limb (of itſelf very liable to riſe very high) is often greatly increaſed; and, to abate this, a large emollient cataplaſm

plaſm is ordered, and changed twice or thrice a day. Under this treatment, the patient is generally ſeized with fever, the inflammatory ſymptoms increaſe rapidly, and commonly end in a fatal mortification of the parts. In healthy and vigorous patients, indeed, whoſe conſtitution is remarkably ſound, and the nervous ſyſtem leſs liable to irritation, the inflammatory appearances may terminate in ſuppuration, and thus the patient's life may be ſaved; but, as this muſt always be in proportion to the tenſion and pain, it will ſtill frequently happen that the patient will be deſtroyed by the exceſſive diſcharge of matter. Where large quantities of matter are formed, the wound at the ſame time being ſmall, and not in the moſt dependent part of the abſceſs, it inſinuates itſelf between the muſcles and bone, as well as between the interſtices of the muſcles, ſo that the whole of the fractured limb becomes at laſt nothing but a collection of bags or pouches for holding it, for a great way both above and below the wounded part. It is impoſſible that this can be the caſe without bringing the patient into extreme danger. In ſuch ſituation, no callus can be formed between the broken ends of the bone, while the ſubſtance of the unhappy patient's body is waſted by the exceſſive diſcharge, or his life deſtroyed by an hectic fever. In ſuch caſes, there is no remedy but

but amputation; for, under the beſt regimen poſſible, the ſtrength of the patient muſt daily decay, and even amputation now becomes a doubtful remedy. If the limb, for any conſiderable way above the fractured place, be ſwelled, and its colour changed to a duſky yellow, with a flabby feel, we may be ſure that all this way the matter extends; and, unleſs we can amputate above this, we have little or rather no chance of ſaving the patient. In this caſe, the matter generally ſurrounds the bone, while the latter commonly aſſumes the ſame yellowiſh colour with the limb itſelf. In one caſe of this kind which fell under my obſervation, the fracture happened to be below the knee joint, juſt at the head of the tibia; but the matter penetrated up the thigh, and ſurrounded the os femoris, nearly as high as the trochanter. After ſome weeks, the limb was amputated near the middle of the thigh, which was ſuppoſed to be above the diſeaſed part, but unhappily this was found to be a miſtake. The matter reached as high as has been mentioned; the muſcles were all detached from the bone to the ſame height, ſo that we could plainly diſtinguiſh the colour of the bone; and at laſt the patient died, perfectly free of any fever, merely from the quantity of the diſcharge, eight days after the operation.

Where

Where the bone does not project through the wound, the mode of treatment is in general the ſame, excepting that there is no uſe for the ſaw; but, in order to aſcertain the nature of the injury, the fore finger is commonly introduced into the wound, and the parts carefully examined with it. In other reſpects, the treatment is not more judicious, and the event commonly no leſs fatal. The great cauſe of all this miſchief, and of the extreme danger attending compound fractures, is, that, where the bone is driven through the ſkin, free acceſs is allowed to the air, the perioſteum, broken ends of the bone, and the marrow, being all expoſed to its influence; and we are aſſured that the contact of atmoſpherical air has always the moſt pernicious effect upon wounds of any kind, of which the following is a moſt convincing proof. In ſimple fractures, even of the worſt kind, that is, where the bone is broken very obliquely, and can hardly be retained in its place, the patient will continue free from any dangerous inflammatory ſymptoms as long as the integuments remain whole; but no ſooner is the ſkin broken, and the end of the bone puſhed out through it, than the moſt violent pain and tenſion take place, accompanied with fever, ſpaſmodic twitchings of the limb, and frequently mortification and death. Very great danger may likewiſe

take

take place from the violence of the injury itſelf. In gunſhot wounds, a ball may paſs quite through the ſubſtance of a bone, thus affording the air a free paſſage to the inſide of both ſoft and hard parts, at the ſame time ſhattering and ſplintering the bone through which it paſſes. Or a bone may be broken into many fragments by the paſſage of heavy and broad carriage-wheels; in which caſe, not only the bone ſuffers, but the muſcles and tendons are ſo bruiſed and torn, that gangrene and mortification are the unavoidable conſequences. By injuries of this kind, alſo, the arteries may be wounded in ſuch a manner as to produce violent or even fatal hæmorrhages, before the ſurgeon has had time to arrive; or the patient's ſtrength may be ſo exhauſted, that nature cannot endure the further fatigues neceſſary to accompliſh a cure.

From theſe and other circumſtances of danger, therefore, the event of compound fractures muſt always be exceedingly precarious; and the firſt conſideration of the ſurgeon muſt be, whether it be poſſible to ſave the limb by any means, or whether he ought not immediately to proceed to amputation, without making any attempt to accompliſh a cure. Here his utmoſt ſkill and attention will be neceſſary; and on this point the greateſt and moſt eminent practitioners have been divided. Some having obſerved that

that nature had performed a cure in cafes apparently the moft defperate, have determined againft amputation in any cafe; while others, confidering the number who have died where it has been attempted to fave the limb, have determined upon amputation in every cafe where the bone is fo fhattered that very violent fymptoms of inflammation would probably take place during the cure. Even where amputation is refolved on, however, it becomes a matter of conſiderable difpute whether the operation ought to be performed immediately after the injury has been received, or whether we ought to wait for fome time before we attempt it. This is a very important conſideration, and is peculiarly embarraffing to the furgeon, becaufe no time is allowed him to deliberate upon the matter; for, if immediate amputation happens to be neceffary, every moment's delay proves difadvantageous to the patient, and a few days may perhaps irrecoverably determine the event againft him. We may, however, fay with certainty, that, if the furgeon delays the operation for two or three days, he ought to wait till the inflammation, tenfion, and fever, which will certainly arife in that time, are, in fome degree, moderated; for, if we amputate under thefe circumftances, the event will almoft certainly be fatal. The following rules, derived from obfervations made by

by the moſt eminent practitioners, may aſſiſt in forming a judgment of theſe difficult caſes:

1. Immediate amputation will be neceſſary where the fracture has happened near a joint, and where the joint itſelf, or the bones adjacent to it, are very much cruſhed and broken.

2. Where the ſoft parts are grievouſly bruiſed, the muſcles lacerated, and the tendons ruptured.

3. If the body of a joint be expoſed, and the large blood-veſſels deſtroyed, ſo that the circulation through the limb is deſtroyed, or nearly ſo.

4. Where the bones, though exactly replaced, cannot be made to ſupport each other firmly, amputation ought to be immediately performed, becauſe, in general, it will be found impoſſible to retain them in their ſituation.

5. In caſes where the limb has been greatly injured, and the patient cannot be kept ſufficiently quiet, it will be proper to take off the limb inſtantly, even although, in other cirmumſtances, amputation would not at all be neceſſary. This direction ought to be particularly attended to in the army and navy, where it is impoſſible that the patients can be kept as quiet as in private practice. Some, indeed, have contended, from the many inſtances there are of compound fractures being cured in military hoſpitals, that there

is no neceſſity for attending to this rule; but, if the matter is fairly conſidered, we muſt undoubtedly ſee that a much greater number die where it is attempted to ſave the limb, than where amputation is performed; and that thoſe who do recover are generally officers, who can be better accommodated than the common ſoldiers. In other caſes, where the patient can be well attended and kept quiet, the judgment of the ſurgeon muſt be directed by the three foregoing rules. But, though the amputation be not inſtantly performed at the time of the accident, there may be occaſion for it afterwards, and for this the following rules will be neceſſary:

1. If profuſe hæmorrhages ſhall have taken place, which cannot be reſtrained by the ordinary means. Theſe ſometimes occur a conſiderable time after the accident has happened, and may be accounted for from the friction of the arteries upon the bone, or ſome of its ſplinters. In this caſe, though it may ſometimes be poſſible to tie up the wounded veſſels in the manner formerly directed, yet, at others, the ſwelling and inflammation are ſo violent, that the wound is not large enough to admit of this; and, if we attempt to enlarge it, the coagulated blood diffuſed throughout the cellular membrane, as well as between the muſcles, prevents us from diſtin-

guiſhing the arteries with any kind of exactneſs, and therefore there is a neceſſity for taking off the limb.

2. Gangrene or mortification. Theſe are ſometimes the unavoidable conſequences of the injury, but ſometimes ariſe from bad management, as when too great violence is uſed in making the extenſion; when the ſurgeon is too buſy in ſearching the wound with his finger or with inſtruments; when the proper means of abating inflammation have been neglected, or where improper dreſſings, &c. have been made uſe of. But, wherever amputation is neceſſary on any account, it ought to be uſed as a preventative rather than a cure. The reaſon is, that the gangrenous diſpoſition takes place in the cellular membrane, while the limb outwardly appears to be ſound; and, if we wait till the corruption has penetrated to the outſide, it will then be found to have gone far up in the cellular ſubſtance, ſo that amputation will not now be any cure, but inſtead of that will haſten the patient's death. The limb ought, therefore, to be amputated as ſoon as there is any good reaſon to apprehend that gangrene and mortification muſt take place; for, if we wait till an alteration in the external appearance of the limb has actually been obſerved, we wait too long, and have no other chance of ſaving the patient's

patient's life, than by aſſiſting nature to throw off the mortified parts, of which ſome inſtances have been obſerved, but ſo very rare, that no ſurgeon, in the leaſt acquainted with his buſineſs, will put the leaſt confidence in them. It muſt be obſerved, however, that, even here, there is a conſiderable difference in the danger to which the patient is expoſed, according to the circumſtances of the caſe. If the tendency to gangrene is the immediate conſequence of the injury, then the neceſſity of amputation is very urgent, and an attempt to ſave the limb will moſt probably deſtroy the patient. But, if this be the conſequence only of bad management in allowing the inflammation to run too high, it may be in our power to put a ſtop to it, by uſing the means already pointed out in the chapter which treats of inflammation, and which muſt be adapted to the conſtitution of the patient as much as poſſible, at the ſame time that they are allowed to exert their force to the utmoſt, for here the moſt powerful remedies are undoubtedly called for.

3. Where the patient is waſted by too great a diſcharge of matter, as in the example already given, where a fracture of the leg proved fatal through improper treatment. This is the caſe in which amputation moſt frequently proves ſerviceable, though, to render it ſo, we muſt be

ſure

ſure that we amputate farther up than the matter has reached. It is alſo a of great importance to determine the time when amputation, in caſes of this kind, can be performed with the beſt advantage. This, indeed, the ſtrength of the patient muſt, in a great meaſure, determine; but Mr Pott has beſides made another obſervation, which may likewiſe be of ſervice in determing the time. He ſays, that, in all thoſe who have had their limbs amputated on account of too great a diſcharge of matter, he did not remember to have ſeen one in which the bones were united. It would ſeem, therefore, that, where the bones do not appear to form any union, after waiting for a reaſonable time, it is proper to amputate the limb, provided the ſtate to which the patient is reduced be not the conſequence of improper treatment on the part of the ſurgeon. This, indeed, there is reaſon to ſuppoſe, may too frequently happen; for, if the antiphlogiſtic regimen be purſued too far, the patient will be reduced to ſuch a degree, that nature is unable to perform her part in uniting the bones, or ſupporting his ſtrength otherwiſe. This ſtate may be known, when, after an high degree of inflammation, the limb becomes not only reduced in ſize, but ſoft and flabby, the pulſe low, the appetite diminiſhed, and the patient

tient is inclined to ſweat, or ſome degree of diarrhœa comes on. Here it is abſolutely neceſſary to ſupport the patient's ſtrength by every poſſible method; and thus the ſurgeon will frequently ſucceed contrary to all expectation, though it can by no means be affirmed with certainty that the limb can be ſaved in all caſes of this kind. Indeed, in what is juſt now ſaid, it muſt be remembered that we ſuppoſe the patient to be totally free from fever; for, if the above mentioned ſymptoms are combined with an hectic fever, amputation is the only chance the patient has for his life.

After the ſurgeon has deliberated on the nature of the fracture, and thinks himſelf authoriſed to make an attempt to ſave the limb, he muſt next conſider in what manner it is to be treated. In ſome few caſes the cure goes on ſo ſmoothly, that the whole ſeems to heal by the firſt intention, as Mr Pott tells us was the caſe with himſelf. In much the greater part, a great inflammation, and very plentiful ſuppuration, takes place, and in ſome there is an immediate tendency to gangrene. In the firſt of theſe, no directions need to be given, excepting what have already come under the head of ſimple fractures. The ſecond ſort, which is by far the moſt common, and which a ſurgeon ought always to expect, may be divided into two ſtages, the

the inflammatory and the ſuppurative, each of which has a mode of treatment proper to itſelf. In the former, the pain, inflammation, and tenſion, are very conſiderable, and require the ſtricteſt obſervance of the antiphlogiſtic regimen, until they are abated; but, when this is the caſe, we muſt not any longer follow this method, but rather endeavour to ſtrengthen and ſupport the patient, leſt he ſhould be waſted and deſtroyed by too great a diſcharge of matter.

When a ſurgeon, therefore, is called to a patient having a compound fracture, he may, in the firſt place, obſerve whether any conſiderable degree of inflammation has already taken place in the limb; and, if this be the caſe, whether the limb can be ſaved or not, he muſt not meddle with any operation whatever, until the inflammatory ſymptoms are gone off. The patient muſt, therefore, be put into a bed properly made, and the limb placed in ſuch a poſture as to relax all the muſcles as much as poſſible. If there are any ſplinters which evidently irritate the parts, and tend to keep up the inflammation, they muſt be removed, but in the moſt gentle manner poſſible, leſt by too much ſearching the wound, either with inſtruments or otherwiſe, we increaſe the inflammation inſtead of relieving it. The wound ought then to be dreſſed with ſoft emollient ointment ſpread on linen, and

and the air very carefully excluded, every method being taken to abate inflammation, as has been already directed.

Sometimes the end of the bone which at firſt has wounded the integuments, and for ſome time projected through them, may have retracted itſelf within the wound by the time the ſurgeon arrives. When this happens to be the caſe, it is a common practice to introduce the finger into the wound, in order to examine the nature of the injury done to the bone; but nothing can be more injudicious or more prejudicial to the patient. We know from experience, that the common air, when allowed to have acceſs to the inſide of a wound, produces the moſt alarming ſymptoms; what then muſt be the conſequence of introducing a finger, and puſhing it about among the muſcles for ſome minutes, nay, among muſcles already lacerated and irritated beyond meaſure? I have, with aſtoniſhment, ſeen this done in ſeveral caſes, three of them very remarkable, where the thigh-bone was fractured about ſix inches above the joint, or near its middle. In all of theſe, the inflammation run ſo high, that, in ſpite of every remedy, the patient died in a few days of a mortification in the part. In all theſe caſes the wound was ſmall, and the bone did not project at the time the ſurgeon arrived.

From

From theſe, and many other caſes that might be adduced, it plainly appears how detrimental it muſt be to introduce any foreign body into the fleſhy ſubſtance of a muſcle when lacerated by a fractured bone. Inſtead of this, the utmoſt care is neceſſary, even in the removal of a ſplinter of the bone, leſt we ſhould further irritate or lacerate the ſoft parts. There is no doubt a neceſſity for taking away the pointed pieces of looſe bone, by which the muſcles are greatly injured and irritated; but this muſt be done with the utmoſt caution; and, where the wound happens not to be large enough for their removal, it muſt be enlarged, though this operation is very ſeldom requiſite, any more than that of ſawing off this part of the bone which projects; though, it muſt be owned, that caſes ſometimes occur in which both may be requiſite. Indeed, if the muſcles of the limb be relaxed, and carefully kept ſo during the time that the extenſion is made, the protruded bone will almoſt always retract within the wound, and allow the fracture to be reduced with eaſe.

The directions for reducing a compound fracture are preciſely the ſame with thoſe for a ſimple one, and need not be repeated here. After the reduction, we muſt bring the lips of the wound together, and ſecure them by adheſive ſtraps; or, if this cannot be done, we muſt

cover it up with pledgets of caddice, dipped in traumatic balſam, in order to exclude the air as completely as poſſible. This being done, if the fracture is of the os femoris, we muſt apply the the inſtrument, repreſented Pl. 2. Fig. 1. in the manner directed for ſimple fractures of that bone, without either ſplints or bandages, only keeping the limb as free as poſſible from motion, and moiſtening it conſtantly with a ſolution of ſugar of lead. If the tibia be fractured, we muſt uſe the metal ſplint, repreſented Pl. 2. Fig. 5. (laying the limb upon it, as directed in ſimple fractures of the ſame bone), which will here anſwer extremely well.

Having reduced and dreſſed the fracture, the next care of the ſurgeon muſt be to prevent any high degree of inflammation, or large ſuppuration. This muſt be done by the methods already laid down; but if, after all we can do, a ſuppuration ſhould take place, we muſt, as ſoon as poſſible, evacuate the matter, and then direct all our attention to prevent it from penetrating between the muſcles and bone, as well as into the interſtices of the muſcles themſelves. For this purpoſe, we muſt make the wound in the moſt dependent part; for, if this is not done, the matter will inſinuate itſelf, whether we will or not, into the places juſt mentioned; and,

though we may afterwards attempt to exclude it by compreſs and bandage, we will, for the moſt part, prove unſucceſsful; nay, we may ſometimes render the caſe worſe, by confining the matter inſtead of puſhing it out, or preventing its collection.

From the very exact manner in which the machine, repreſented Pl. 2. Fig. 1. fits the thigh, and the ſupport it gives to the fractured part, it is evident, that, when it is uſed, the thigh may be placed in almoſt any direction, ſo that the wound may be made as depending as poſſible. It ought to be dreſſed every day with pledgets of ſimple liniment, Turner's or Goulard's cerate, &c. for every acrid or ſtimulating application muſt here be injurious; and, during the time of dreſſing, the utmoſt care muſt be taken to admit the air as little as poſſible; and, after the dreſſing is over, we muſt, with the utmoſt care, cover the ſore cloſe up, that there may be as little ſuppuration as poſſible.

During the inflammatory ſtage, we ought, among other methods of allaying inflammation, to make uſe of emollient cataplaſms and poultices; but, when once the ſuppuration has taken place, and matter is actually formed, they ought to be laid aſide. Even at the very firſt, indeed, unleſs ſome conſiderable degree of inflammation exiſts, they ought not to be employed, becauſe of

of their tendency to promote ſuppuration; and this, in any great degree, is always to be avoided. But, at whatever time it happens, or from whatever accident, any degree of tenſion and ſwelling ſhall take place in the limb which reſiſts reſolution by the method already mentioned, then an emollient cataplaſm is one of the beſt remedies that can be applied; but, if we perſiſt in the uſe of cataplaſms after the intention with which they were applied has been fulfilled, they are apt, by reaſon of their heat and moiſture, to produce a defluxion upon the part, with an increaſed action of the veſſels, &c. by which means the purulent diſcharge is augmented to a great degree, which in compound fractures ought always to be avoided.

While the reunion of the bones is going on, the ſore ſhould be tightly dreſſed in the manner already directed, and kept very cool, by uſing a thin covering to the parts, (though ſufficient to exclude the air), and waſhing the wound frequently with ſolution of ſugar of lead. The times of dreſſing muſt be in proportion to the quantity of matter produced, frequent if it is copious, and more ſeldom if otherwiſe. If the diſcharge be very conſiderable, the patient muſt be carefully ſupported with wine and bark, as well as a nouriſhing diet, as much as his ſtomach will bear. He ſhould have elixir of vitriol to the extent of thirty or forty drops in a little water,

water, after each dose of the bark, which, in cases of this kind, is a medicine of the utmost consequence. When the discharge is copious, and the wound not in the most dependent part, the whole inside of it should be dressed with fine scraped linen like soft downs, called *charpee*, which will absorb the superabundant moisture. In short, the business of the surgeon is, in the cure of compound fractures, to endeavour, as much as possible, to reduce them to simple ones; and this he is to attempt by the following means: 1. To exclude the external air from the wound the first moment he is called to the patient. 2. To reduce and replace the fractured bones. 3. To lay the limb, either in a case of metal adapted to it, in a proper relaxation; or, if the thigh-bone is fractured, to apply Dr Aitken's splints. 4. To prevent or reduce inflammation as much as possible, by leeches, cupping, and scarification, or other means for that purpose already mentioned; all of which must be pushed as far as the strength of the patient will admit. Among the external applications for this purpose, I would recommend solutions of sugar of lead, and sal ammoniac, &c. 5. A strict attention must be paid to the state of the patient's belly, which must by no means be suffered to be costive, but must be kept open every second day, with a dose of five drachms of Rochelle salt infused in six ounces

ounces of water gruel, and drunk in the morning.

Thus, the compound fracture will, as far as poſſible, be reduced to a ſimple one, and heal as ſuch; and, by following this method, I have ſucceeded in the cure of ten patients, whoſe caſes ſhall be afterwards related; and in none of them did any high degree of fever or inflammation take place. There may, however, occur caſes, in which the limb is ſeverely mangled, the muſcles being greatly torn, and the bone broken into many pieces, with a very large external wound, and at the ſame time near the joint. Here I would adviſe immediate amputation, as the only means to ſave the patient's life; for, even though mortification ſhould not immediately take place, the exceſſive diſcharge from ſuch a large ſuppuration, as muſt undoubtedly enſue, would certainly deſtroy the patient. The reaſon of this has been already explained, and the danger of too great a diſcharge of matter abundantly ſhown. To what has been ſaid, however, we may add, that, in caſes where the bone has been ſplintered, the matter being of courſe conſtantly in contact with the ſplintered portion, the latter is deprived of its perioſteum, by which it is rendered unfit for being united by a callus to the reſt. Of conſequence, it becomes a very troubleſome ſtimulus, and will in the

the end deſtroy the patient. Where this happens to be the caſe, we muſt cautiouſly make an inciſion upon it, and, in the moſt gentle manner poſſible, remove it altogether. This may, perhaps, be neceſſary, even where the whole of the ſplinter is not denuded of its perioſteum, but adheres by it to the ſound part of the bone; and, in this caſe, the looſe piece muſt be carefully diſſected from the muſcle, or to whatever it adheres, and the wound firmly drawn together by adheſive ſtraps, ſo that the patient may not be incommoded, either by the external air, or the purulent matter; and thus it heals, as it were, by the firſt intention.

## SECTION. XVII.

*CASES ILLUSTRATING THE PROPRIETY OF THE PRACTICE RECOMMENDED IN THE FOREGOING SECTIONS.*

I. On the 10th of March 1785, early in the morning, Mrs H—, a lady's maid, imagining in her ſleep that her miſtreſs called her, ſtarted up and ran towards her room; but, in her way thither, fell down a flight of ſtairs, and,

and, by the fall, fractured her right thigh-bone, about five inches above the joint; at which place, the under end of the bone was forced through the rectus muscle and other integuments, projecting about two inches and an half through the wound, which was exactly of the shape of the bone itself, and just large enough to let it pass through. I was instantly called, and, in the first place, prepared a bed, by placing a firm hair matress upon the top of a feather bed; after which, the patient was laid upon it. The knee was then gently bent, and the patient turned a little to the right side; after which, an assistant took hold of the thigh immediately above the fracture, while I laid hold of the under end of the bone above the knee. The fracture was transverse, and, on making a gentle extension, was easily reduced. After the reduction was performed, I placed the thigh upon a splint of wood, reaching from the top of it to the joint of the knee; and, in this position, the whole was laid upon a pillow of the same length. The wound was then completely covered up by pledgets dipped in traumatic balsam; and, on the afternoon of the same day, sixteen leeches were applied to the part affected; and, after they had discharged freely, two or three folds of flannel, moistened in a solution of sugar of lead, were applied. Next day, the swelling,

ſwelling, tenſion, and pain, were very inconſiderable; and, on the third day, (March 12th), the pain was almoſt entirely gone, the ſaturnine ſolution and leeches having been applied the evening before. There was, however, ſome ſwelling, though no great degree of tenſion, in the limb; and the leeches and ſaturnine ſolution were applied as before. As her belly was rather coſtive, a pound of water was given by way of glyſter, which procured her a ſtool. On the 14th, the ſwelling and tenſion were quite gone; and, on taking off the dreſſings four days after, the wound appeared quite filled up, wanting only to be ſkinned over; not a particle of matter appearing about it. On the 24th it was completely whole, without any pain or ſwelling in the limb, her appetite good, and every function natural. The limb was unlooſed for the firſt time on the 30th, and the knee gently bent, and then ſtretched out ſeveral times without any pain or uneaſineſs. The flannel on the inſide of the ſplint was removed, and a freſh piece put in its place, and the limb again put into its former poſition. Every ſecond day after it was gently raiſed and moved; in five weeks ſhe could walk through the houſe with a crutch; and, in two more, was able to reſume her buſineſs, the limb being as ſtraight as if it had never been broke.

II. J. L—g, a labourer, about thirty-six years of age, had both bones of his left leg broken near the middle, and both forced through the integuments by a fall. I saw him about half an hour after the injury was received, with the ends of both bones projecting about an inch and an half. He was immediately put to bed; after which, having caused an assistant take hold of the leg below the knee, just above the fracture, I took hold of it near the ancle. The ends of the bones were replaced after a gentle extension, as in a simple fracture, and a splint of wood adapted to the whole half of the back part of the leg, from the joint of the knee, immediately above the ham, to the point of the heel, in such a manner as exactly to surround the whole back part of the limb. This being lined with several folds of flannel, and applied to the limb, I dressed the wounds with several pledgets dipped in traumatic balsam. The splint was then firmly tied upon the limb by two soft flannel bandages, one immediately below the knee, and the other above the ancle. The patient had no pain nor swelling for the first twelve hours after the fracture was reduced; but the day after, (May 16th 1786), he complained of pain and heat in the limb about the fractured part, which, upon examination, was found considerably swelled, with some degree of tension,

and painful to the touch. I had reduced the bones, and ſecured them as in a ſimple fracture; the limb was raiſed up, and ſupported upon two thick pillows, ſo that the knee joint might be conſiderably bent, while the leg reſted wholly on the back part, and his foot was ſupported on each ſide by pillows, as well as by a bandage that croſſed his foot about the middle, and was pinned to the bandage which ſurrounded the leg at its lower part on each ſide. Finding, upon inſpection, no fault with the manner in which the leg was ſecured, I applied twenty leeches to the place where the pain was, promoting their diſcharge by warm dry cloths; and, after they had bled freely, the part adjacent to the wounds was covered up with cloths dipped in a ſolution of two drachms of crude ſal ammoniac, in a pound of vinegar, mixed with an equal quantity of water. Next morning, he was purged twice briſkly with two drachms of compound powder of jalap, mixed up with a little ſyrup, into an electuary. Thus, the pain and heat were diminiſhed, but the ſwelling rather increaſed. Next evening, therefore, the leeches were again applied, and, after they had blooded freely, the ſolution. On the 18th, the ſwelling, pain, and heat, were all greatly abated, the ſolution and laxative electuary were continued. The cure now went on without any unfavourable

favourable ſymptom, excepting ſome ſtartings of the limbs. On the 26th, the dreſſings were removed, and the wounds ſeemed nearly whole. In four days more the ſplint was removed, and a freſh one put in its place; the limb ſeemed almoſt of its natural ſhape, and the patient bore all its motions without any pain; the wounds were perfectly ſkinned over; and, in four weeks and three days, he was allowed to walk through the room with crutches, but with the bandage firmly fixed about his foot and leg. At this time, he ſaid he could almoſt bear his whole weight upon the fractured limb; and, in ſeven weeks, he could walk without any pain or uneaſineſs, or any ſtiffneſs about the joint. This patient was in the vigour of life, and yet neither pain nor inflammation came to any height. The ſplint was applied in ſuch a manner as to counteract the force of the great muſcles of the leg, ſo that they could not draw the foot out of its natural poſition; and hence the limb, when cured, could not be diſtinguiſhed from the other.

III. H. D. a young man of twenty-four years of age, had his left thigh-bone fractured by a fall from his horſe, about ſix inches above the joint of the knee. The fracture was very oblique, and the under end of the bone was forced through the integuments near the external

external edge of the rectus muſcle, projecting through the wound about two inches. About an hour after the accident I was called, when I found the parts as deſcribed. The patient was put to bed, and the bone reduced with eaſe through the opening; but, by reaſon of the obliquity of the fracture, it could not be retained in its poſition, only that now, inſtead of protruding through the wound, it was now drawn upwards below the muſcles of the thigh. Notwithſtanding this unfavourable appearance, however, the external air was completely excluded from the wound, by the application of ſeveral layers of caddice moiſtened in traumatic balſam, and the machine, repreſented Pl. 2. Fig. 1. applied to keep the bones in their places. After they had been accurately fitted to one another, and ſecured by the ſplints, the patient was laid upon his back, the knee joint gently bent, by the height of the upper part of the bed, which was made according to the directions formerly given. Twenty leeches were then applied about the wound, and fore part of the thigh. the diſcharge encouraged as directed, and a cloth moiſtened in ſpiritus mindereri afterwards applied. Next day, the ſame applications were repeated, the patient continued eaſy, with very little ſwelling in the part; but, as there was a conſiderable tenſion, with a full and ſtrong pulſe, he was blooded

blooded to twelve ounces, and had an electuary of compound powder of jalap made up with syrup, a tea spoonful to be taken in the morning, every two hours, till it operated freely. Three days after the operation, (10th August 1789), the limb appeared quite straight, and in its natural position; but, as he had some pain and other inflammatory symptoms on the 12th, the leeches were again applied, along with saturnine and other antiphlogistic medicines. By the use of these, the cure went on so well, that, on the 20th, he sat up with a bed chair behind him, and moved his leg backward and forward without any pain or uneasiness. On the 12th of September, he walked into the garden with crutches without feeling the least pain; and, in six weeks from the accident, the bandage was taken off, and he walked easily, with only a stick in his hand, the limb which had been broken being not in the least shorter than the other.

IV. A—m J—s, a man of fifty years of age, fell from an height of fifteen feet, pitching on the top of his left haunch. The neck of the bone was broken by the violence of the fall, and a wound made in the integuments near three inches long, just opposite to the trochanter, which was thus completely laid bare. He was carried home after the accident five miles, his bed properly

ly made, and then laid upon his back, turning a little to the right ſide. I reduced the broken limb exactly to the length of the other; and, having brought his knees nearly together, the thigh was ſupported with two pillows, one of which reached to the top of it, while the other was doubled and placed from the middle of the thigh to the top of the tibia, by which means the knee was gently bent, and the large muſcles on the haunch relaxed as much as poſſible, and the wound was then drawn together by adheſive ſtraps. As the ſwelling, pain, and tenſion, were very great, it was found neceſſary to apply leeches repeatedly, keeping the body open by gentle laxatives; and, as he was beſides diſturbed by frequent ſtartings of the limb, I ordered him frequent doſes of laudanum in very large quantity, not leſs than ſixty drops morning and evening, which were attended with great advantage. No violent ſymptom, however, took place during the whole of the cure, and his pulſe never beat more than eighty ſtrokes in a minute. In ſeven weeks from the accident, he rode in a cart to Edinburgh from a diſtance of ſix miles; and, having alighted from it, walked along the ſtreets for half a mile with only a ſtick in his hand. In this caſe, neither ſplint nor bandage was made uſe of, and the wound healed by the firſt intention. After his recovery, he could hold an halfpenny

halfpenny between the balls of his great toes, ancles, calfs of his legs and knees, a remarkable proof of the exact poſition and union of the bones in their natural ſituation.

V. J—s D—d, forty-three years of age, had the bones of the leg cruſhed. The tibia was broke into ſeveral fragments, and there was a wound of ſeveral inches long through which the ends of two of the fragments appeared. Having put him to bed, I examined the nature of the injury, and found that about three inches of the tibia was ſeparated from the reſt, both on the upper and under part; which portion, by feeling it through the integuments, (for I did not introduce my fingers into the wound), ſeemed alſo to be broken longitudinally into ſeveral pieces. A very conſiderable hæmorrhage had alſo taken place, but was now ſtopped by the cold. Having thus, without injuring the patient, aſcertained myſelf of the nature of the injury he had received, I relaxed the muſcles in the manner already directed, I extended the limb fully, and, with the forefinger and thumb of my left hand, endeavoured to replace the fragments. In this I ſucceeded, and knew that I had done ſo, both by the feel, and the ceſſation of the violent pain which always takes place where the ſoft parts are wounded by the ſharp fragments

of

of a broken bone. As the wound was on the fore and inſide of the leg, I applied a large wooden ſplint, lined with flannel, from above the ham to the point of the heel, ſecuring it properly with bandages. The edges of the wound were afterwards brought together, and carefully covered up with a large adheſive plaſter, to exclude the air completely from the wound, but without covering much of the adjacent ſound parts. The limb ſwelled conſiderably, and he complained of much heat and tenſion, though the pain was not great. Twenty-four leeches were applied towards the evening, but without giving much relief. He had a reſtleſs night, and in the morning (21ſt February 1790) the ſwelling and tenſion were much increaſed; his pulſe beat ninety-ſix ſtrokes in a minute, but there was no remarkable inflammation about the edges of the adheſive plaſter. The leeches were repeated, and ſixteen ounces of blood taken from his arm; the fore part of the limb was covered with cloths moiſtened in ſolution of ſugar of lead, and he was ordered barley water, acidulated with vitriolic acid, for drink. By theſe, the ſymptoms were much relieved, though the ſwelling remained conſiderable till the 5th of March; but, before this time, he could bend his ancle joint freely, and, with aſſiſtance, had alſo moved his knee joint. On the

the 10th, the wound was completely healed up, and the fragments of the bones ſeemed to be fully united, but a protuberance from an overgrown callus was perceptible. On the 20th, he walked, for the firſt time, through the room with crutches, and in ten days more was able to walk eaſily with only a ſhort ſtick in his hand. In this patient, the leg was placed upon a pillow, on the back part of it, with the foot erect, and ſupported on each ſide by pillows as before directed, by which means it was kept firmly in its place. A bandage was put round the middle of the ſole of the foot, and firmly pinned to the roller on each ſide of it, to keep it at a right angle with the bones of the leg. Thus, the ſtrong muſcles on the back of the leg were entirely counteracted, while thoſe on the fore part were relaxed as much as poſſible. In fractures of this kind, it is neceſſary to elevate the limb with pillows, that the knee joint may be bent with freedom.

VI. J—n B—ne, a lad of twenty, fell from a window three pair of ſtairs high, and was greatly bruiſed on his left ſide and wriſt; his lip was divided by a wound nearly an inch long, and his left thigh was broke a little above the middle, with a wound of conſiderable ſize, cor-

reſponding in ſhape to the fractured bone. The muſcles of the limb being relaxed, the bones were replaced, and the wound dreſſed with caddice and traumatic balſam; after which, the limb was laid in a relaxed ſituation upon its outſide, on a ſtrong wooden ſplint, firmly ſupported by pillows. The lip was afterwards ſecured by two gold pins and the twiſted ſuture, and ſixteen ounces of blood were taken from the arm. Next day he was pretty eaſy, without any great ſwelling or tenſion of the limb, and he did not complain of any pain, the pulſe about eighty-ſix in a minute. Leeches were applied, and, after them, cloths dipped in a ſaturnine ſolution. In three days, the ſwelling and pain were completely gone; he had no bad ſymptom throughout the whole time of the cure, excepting once a teneſmus attended with gripes, which were removed by anodynes. In thirty-five days from the accident he was quite well, and able to walk without uneaſineſs, though, beſides the fracture, he had been much bruiſed otherwiſe.

VII. A—w T—n, thirty-ſix years of age, fractured his right leg by a fall down one pair of ſtairs. The fracture was made immediately above the ancle joint, and there was a wound made by the tibia, near the upper part of

of the limb, extending along its whole anterior part. The outer edge of the bone projected through the wound, and the foot was turned a little backward; on which account, I was obliged to take the foot in one of my hands, and the heel in the other, extending it with a good deal of force, and pulling the foot forward, while an affiſtant held the limb very firmly, and preſſed back the tibia. The bones were thus exactly replaced, after which the wound was dreſſed with adheſive ſtraps to prevent the admiſſion of air into it; and the limb and foot were placed on their outſide upon a pillow, being ſecured by other pillows from motion. Several leeches were inſtantly applied, and the part was kept moiſtened with cloths dipped in ſpiritus mindereri. No bad ſymptoms occurred during the cure, excepting once ſome degree of watchfulneſs which was quickly removed by an anodyne. In thirty-four days from the accident he was able to walk eaſily, and without any aſſiſtance.

Theſe caſes ſo fully demonſtrate the rectitude of that method which I have inculcated for the treatment of compound fractures, that I hope the reader will excuſe me for not relating nine others which have fallen under my care, and in which the event was equally fortunate. In all

of

of them the wounds healed by the firſt intention, which I attributed to the care taken to exclude the air, and from my not having done any injury to the parts, by ſearching with the finger or otherwiſe. No inflammation, ſwelling, or tenſion, ever took place in any high degree; nor did I ever obſerve the ſmalleſt tendency to ſuppuration in any one of them. It may be neceſſary, however, to remark, that I always examined the protruded part of the bone before reducing the fracture, to ſatisfy myſelf whether it was covered with the periofteum or not. In every caſe I found it perfectly ſound, and, on this account, reduced it as quickly as poſſible. I cannot ſee any reaſon to heſitate, in caſes of compound fracture, at reducing them as ſimple ones, excluding the air as completely as poſſible, and then to apply ſplints, bandage, or Dr Aitken's machine; and, immediately afterwards, to apply the remedies proper for preventing inflammation, viz. leeches, blood-letting, cooling applications to the parts, and gentle purgatives. I have always found it more eaſy to prevent inflammation in this way, than to cure it after it has been ſuffered to come on, and the ſymptoms to run high; and here, I am ſorry to ſay, that patients often ſuffer, either through the ignorance or neglect of the ſurgeons. In none of the caſes which fell under my care was there

any

any uſe for warm applications, as poultices and cataplaſms; and, from the obſervations that I have made, I think they are generally pernicious, unleſs you wiſh to produce ſuppuration. In caſes of hæmorrhage attending a compound fracture, if the bleeding veſſel cannot be tied up, it muſt be ſtopped with ſponge, agaric, or any other ſtyptic. In one caſe which fell under my care, the patient had been ſtabbed by a bayonet. The weapon had paſſed between the radius and ulna, fracturing both bones, and dividing the intercoſtal artery. Before I ſaw him, it had been propoſed to amputate the arm; but, as the man was very young and very healthy, I thought it wrong to take away the arm, until every method to ſave it had been tried in vain. I therefore propoſed to make an inciſion down to the interoſſeous artery, and either to take it up, or to apply ſuch ſtyptics as might probably ſtop the hæmorrhage. This being agreed to, I placed the arm on a pillow, laid upon a ſmall table, and with a ſcalpel divided the parts for an inch on each ſide of the wound till I came to the wounded artery; but, from the depth of the wound, I found it was impoſſible for me to put a ligature upon either end of it. Upon this, I covered each end of the artery with ſmall thin pieces of agaric; and, having done this, I next filled the wound with charpee to the ſurface. The arm was then placed

placed as ſtraight as poſſible upon a pillow, and the dreſſings kept firm in their place by a bandage and compreſs. As the patient was of a very healthy and vigorous conſtitution, and in the prime of youth, I found it neceſſary to bleed him freely. Next day, therefore, I took away ſixteen ounces of blood from his arm. The fractured limb was kept very cool, and ſeveral leeches repeatedly applied to it, round the edges of the wounds, as near as the dreſſings would permit, in order to prevent too high a degree of inflammation. In ſix days from the application of the ſtyptic, the dreſſings were thrown out by ſuppuration; and, as I ſaw no blood mixed with the matter, I took it for granted that the ends of the artery were healed, and therefore brought the ſides of the wound together as cloſe as poſſible by adheſive ſtraps. The wound was then dreſſed ſuperficially, and the dreſſings renewed every day, the arm being always laid very carefully upon a pillow ſupported by a broad ſplint. Cloths, moiſtened in a ſolution of ſugar of lead, were kept conſtantly applied to the parts adjacent to the fracture, and not the ſmalleſt hæmorrhage appeared from the time it was firſt dreſſed; and, in the ſpace of four weeks from the accident, the bones were fully united, and the wound healed up, ſo that he had the uſe of his arm as completely as ever. In this caſe the patient's

patient's arm was ſaved, though not without putting him to ſevere pain; which, however, he did not repine at, after the uſe of the limb was reſtored without deformity or defect. I muſt conclude, therefore, that we ought never to amputate an arm, on account of hæmorrhage, until every method to ſtop it has been unſucceſsfully tried.

When any portion of the bone is removed in caſes of compound fracture, either by ſawing off, or otherwiſe, the cure muſt neceſſarily be much more tedious than otherwiſe it would be, becauſe nature has now not only to unite the broken bones, but to reproduce a new one, which is very ſlowly done; though, where the conſtitution of the patient is good, it always will be done, and the limb reſtored to its former vigour. We are not, therefore, to amputate a limb on account of the bones being cruſhed in ſuch a manner that many ſplinters muſt be removed, and a great loſs of bone incurred; but as little are we to cauſe or augment this loſs, by ſawing off part of the bone, merely becauſe it has protruded through the wound, and had committed a fault by ſo doing. I have already ſaid, that, in none of the caſes which have occured in my practice was this ever neceſſary, though it is recommended by chirurgical writers without giving any reaſon for their practice.

tice. Mr Gooch inform us, that, "in thirteen compound fractures, he has ſawn off a conſiderable portion of the tibia, and ſucceeded in both old and young ſubjects." There is no doubt that he has; but I have as little doubt that he would have ſucceeded better, if no portion of the bone had been ſawed off. Here he put nature to the trial, whether ſhe could reproduce bones or not, and found that ſhe could. Indeed we have many remarkable inſtances of this reproduction, of which I ſhall mention a few, in order to ſhow, that, unleſs circulation be deſtroyed in the ſoft parts, we have nothing to fear from the loſs of ſubſtance in a bone, however great; and therefore ought never to amputate, on account of the violent injury which the bone has received, if the ſoft parts are not torn alſo.

In the Medical Obſervations, vol. 2d, we have an account of a caſe, in which the greateſt part of the thigh-bone appears to have been reproduced. The patient, when only thirteen years of age, got a blow upon his thigh when at ſchool. At firſt the pain was ſlight, but, in a few months, the part inflamed, ſwelled, and an abſceſs ſeemed to be formed. At length the tumor burſt, a ſmall hole was formed on the inſide of the limb about three inches above the knee joint, and great quantities of ſanious matter were diſcharged by it for eighteen or twenty

months. During all this time, however, he he was able to walk, with the aſſiſtance only of a ſtick; and even after the point of the bone began to make its appearance, which it did at the end of the twenty months above mentioned. This bone was very ſharp and rough, and hurt him much when any thing caught hold of it. At laſt, after having ſuffered much diſtreſs for two years and an half, finding the bone farther out, and more looſe than uſual, he brought it away by one ſtrong pull, no other inconvenience attending the ſeparation than an hæmorrhage, which ſoon ſtopped of itſelf; the wound ſoon after healed up, and he quickly recovered the uſe of the limb, with only a ſmall and ſcarce perceptible halt. The bone brought away in this caſe was not a ſplinter, but a large portion of the os femoris, complete and undisfigured by diſeaſe, excepting at its two extremities where it was carious. It is difficult to conceive how the ſtrong muſcles of the thigh could be ſupported while the new bone was forming, and the old one unable to perform its office. Very little difference could be perceived in the ſhape of the thigh from which the bone was taken, only it it appeared ſomewhat thicker, and more curved than the other.

In the ſame paper, we have an account of a carious thigh-bone cured in a negro boy of

twelve years of age, though the patient was ſo emaciated by the diſcharge of purulent matter, and an hectic fever, that it ſeemed unſafe even to amputate the limb. It muſt be obſerved, however, that the principal medicine in this caſe was "a good nouriſhing diet," to which negro ſlaves are ſaid to be ſo great ſtrangers, that we may well ſuppoſe that in them nature, when properly aſſiſted, will do wonders; as, indeed, it is a wonder that ſhe can ſupport life in them, even where no accidental diſeaſe occurs, conſidering the manner in which they are treated.

Mr Gooch relates a very remarkable caſe of a boy of twelve years of age, who, having been made very drunk, had both bones of his leg fractured in a ſhocking manner, by the wheel of an heavy waggon paſſing over the limb, in an oblique direction, while it was lying in a deep rut, from below the knee to the extremity of the heel. Along with the fracture, there was alſo the moſt dreadfully contuſed and lacerated wound that the ſurgeons who attended him had ever ſeen. Here, for what reaſon we are not informed, they began with ſawing off a conſiderable portion of the bone that remained, though there were a number of looſe fragments which they were at any rate obliged to remove, by which means the bone was entirely deſtroyed for no leſs a ſpace than five inches in length.

The

The cure, however, went on proſperouſly, ſo that in *four months* the patient could move his limb; and, in *little more than half a-year*, could walk pretty well without the aſſiſtance of a ſtick. In this, and other caſes where the bone was ſawed, Mr Gooch had an opportunity of obſerving the manner in which bones are formed, and found that they appeared at firſt like granulations of fleſh, which becoming gradually harder, at laſt changed into a bony ſubſtance. The very great length of time, however, requiſite for the proceſs of oſſification, ſhow how cautious we ought to be in removing any part of a bone that can poſſibly be ſaved; as thus, without any neceſſity, we prolong the patient's trouble, and render the cure tedious and liable to accident, which might otherwiſe have been eaſy and expeditious.

## CHAPTER V.

## *OF LUXATIONS.*

By the term *Luxation* or *Diſlocation*, ſurgeons have long been accuſtomed to denote the ſituation of a limb when the bone belonging to it is

is put out of its natural place. This moſt commonly is occaſioned by external violence or injury, but ſometimes is the effect of old age or debility induced by ſome diſeaſe. I was acquainted with a gentleman, a ſtudent of phyſic, in whom a diſlocation of the right ſhoulder had taken place from mere debility, ariſing from an habitual diarrhœa which had continued from his infancy, and could not be ſtopped by any internal remedy. But it is only about thoſe diſlocations which ariſe from external injuries that the chirurgical art is verſant. Theſe are all the twiſts or ſudden unnatural contortions that can be ſuppoſed to take place, either in the common actions of life, or in conſequence of blows, falls, &c. by which bones may be broken as well as diſlocated. The moſt common cauſes are leaping, or alighting, falſe ſteps, &c.; but none of theſe could, in ordinary caſes, produce a luxation, were the muſcles which cover the joint to exert their full force at the time the accident happens. Thus, though nothing is more common than when a perſon ſlips his foot falls backward, and, endeavouring to ſave himſelf upon his hand, in that caſe to diſlocate the joint of the wriſt; yet, had he at the time the good fortune to throw into immediate action all the muſcles of the hand and fore arm, he would only ſuffer a bruiſe on the palm of the hand, without

without any diſlocation. But, if theſe muſcles do not exert themſelves in this manner, the wriſt, being looſe, bends under the weight of the body, ſo that the ligaments are burſt, and the bones forced out of their places. The reaſon of this is, that, when the muſcles which paſs over the joint do exert themſelves with conſiderable force, they are generally as immoveable as any part of the ſolid limb itſelf. Hence, it muſt be obvious that diſlocations never can take place but when the muſcles are altogether in a ſtate of inaction, which allows the bones to be forced out of their places by the injury, and the ligaments of the joints are either torn, or elongated to ſuch a degree that they cannot retain them.

As the force which diſplaces a bone from its natural poſition may alſo, if ſufficiently great, puſh it through the integuments, it thence follows that luxations, as well as fractures, may ſometimes be attended with wounds, and therefore may, with equal propriety, be divided into ſimple and compound. By ſome practitioners, the term *compound* is applied to luxations only when they are accompanied with fractures; but in this caſe they are more properly ſaid to be of a complicated nature.

The more extenſive the motion of any joint is, the more liable is it to luxation in caſe of any external accident; and hence the ſhoulder joint,

joint, being the moſt moveable, or at leaſt capable of the greateſt variety of motions of any in the whole body, is moſt liable to accidents of this kind, and luxations of the os humeri are the moſt common of any. Compound luxations generally take place in the wriſt or ancle joints.

A joint is known to be diſlocated by pain, greater or leſs, in proportion to the injury done to the ſoft and ſenſible parts, and from the preſſure of the head of the bone upon them after the diſlocation has taken place. 2. By the loſs of motion which always takes place in ſome degree. Sometimes the limb is rendered abſolutely ſtiff and immoveable, with moſt acute pain on the ſmalleſt attempt at motion; in other caſes, the limb may be moved in ſome degree without any great increaſe of pain. Theſe different circumſtances are owing to the nature of the ſurrounding parts, and the poſition which the bone aſſumes after its diſlocation. 3. An alteration in the ſhape of the joint. This is evident, both to the eye, and likewiſe to the touch, eſpecially that of a ſkilful ſurgeon. 4. Diſlocations are always attended with a ſwelling about the joint, which is always of the inflammatory kind, ariſing entirely from the injury done to the ſoft parts.

It

It is a matter of great importance to diſtinguiſh, with accuracy, a fracture from a luxation; for ſometimes, when a fracture happens to be very near a joint, it is apt to be miſtaken for a diſlocation. This, however, may always be done, by making the head of the bone roll, which is done by rolling the limb to which it belongs. If the bone is broken, a grating, occaſioned by the friction of the broken ends of the bone upon each other, will be diſtinctly perceived, but not in a luxation. Violent ſprains, or partial luxations, are more difficult to be known. In the latter, which chiefly take place in the wriſt and ancle joints, there is a movement of one of the bones a very little way out of its place, by which means the capſular ligament is either torn or too much ſtretched; the conſequence of which is, that an high degree of pain and inflammation takes place, accompanied with ſubſultus tendinum fever, and every other bad ſymptom. Even in ſprains, where none of the ends of the bones have been moved, or if they have been ſo, have inſtantly returned to their places, if the joint happens to be uſed too freely ſoon after the accident, the moſt formidable ſymptoms are frequently produced, ſuch as violent pain, a puffy ſwelling, immediately oppoſite to the pained part, and probably occupying each ſide of the joint. If this is neglected, an high degree of inflammation

inflammation takes place, and increaſes rapidly, accompanied at the ſame time with a proportionable increaſe of pain, and at laſt a tendency to mortification. In theſe, the ſymptoms are more violent than in a complete luxation, which is ſeldom dangerous, and may almoſt always be cured by a ſkilful ſurgeon. Sprains and partial luxations are frequently confounded with one another, by which means the patient is often, for life, deprived of the uſe of his limb, which might have been preſerved by a proper degree of ſkill and attention on the part of the ſurgeon. Where the luxation is complete, the cure cannot be effected by nature alone; though, in ſome caſes, where the joint has not been reduced in time, we find that nature, in a ſurpriſing manner, adapts the part into which the bone is forced to receive and retain it in its new ſituation. For this purpoſe, a kind of new ſocket is formed, but the motion and functions of the limb are forever loſt. If the reduction of a luxated joint, therefore, is delayed beyond a certain time, we may be certain that a conſiderable degree of concretion of the parts will take place, and conſequently the operation be rendered more difficult, or perhaps impracticable. In every complete luxation, the capſular ligament is certainly torn in a greater or leſſer degree; and, therefore, the longer that we delay the operation,

operation, the greater difficulty will we find in performing it when it is attempted. The age of the patient has alſo a conſiderable effect in the reduction of luxations; or perhaps we might with more accuracy ſay, that it is the vigour or debility of the conſtitution which has this effect; for in old age, or delicate and debilitated patients, the muſcles give little reſiſtance, and the bones are eaſily replaced in their natural ſituation; for, as in fractures, the only obſtacle we have to overcome is the reſiſtance and action of the muſcles; and therefore in healthy and vigorous ſubjects this reſiſtance muſt be the greateſt.

It has already been mentioned, that, in violent ſprains, where none of the bones are moved from their places, the ſymptoms are frequently much more violent than in complete luxations of the large joints, viz. in the ſhoulder or haunch joints, or even in the elbow or knee; but, were this entirely owing to the tearing or ſtretching of the capſular ligament, the direct contrary would happen; for, as has juſt been mentioned, the capſular ligament is torn in every complete luxation, and therefore the pain ought to be in proportion to the extent of this ligament, or of the largeneſs of the joint; but, as it is not ſo, we thence learn that it is not from the capſular ligament that the pain proceeds. To me it ſeems

to arife from the following cauſe: As all the ſmaller joints are more covered with membraneous and tendinous expanſions than the large ones; and, in a natural ſtate, as all the veſſels which ſupply theſe appear to be almoſt colourleſs, the violent irritation produced by a ſtrain forces red blood into theſe veſſels, which proves a ſtimulus to them in the ſame manner it does to the eye. Thus, every ſymptom is increaſed; and, unleſs proper care is taken here to diminiſh this irritation, very violent ſymptoms of inflammation will take place; whereas, in caſes of complete diſlocation, where the capſular ligament only is torn, no ſuch alarming ſymptoms ever take place; and every ſymptom of tenſion and ſwelling has been known to go off without the application of any remedy whatever; and, even where the joint has not been reduced, the pain and inflammation have been known to go off entirely. The reaſon is, that the large joints have none of the membraneous or tendinous coverings which envelope the ſmaller ones, but are only covered with large muſcles. In ſevere ſprains, where the violent ſymptoms above mentioned occur, we muſt apply leeches freely, and repeat them in proportion to the degree of pain and other concomitants of inflammation, keeping the parts cool with cloths dipped in ſolution of ſugar of lead.

Where

Where a luxation is complicated with fracture, either in one or both bones of a limb, it will be improper to attempt any reduction of the luxation, till both the fracture and conſequent inflammation have been cured. But, in caſes of this kind, if we do not take care to reduce the fractured bones exactly to their poſition, and keep the limb in a relaxed ſtate, preventing alſo the inflammation from running to any height, there will be danger of extenſive ſuppurations, carious bones, and other bad ſymptoms, ſo that the patient may think himſelf well off if he eſcapes with a callous joint. It is plain, therefore, that the more ſpeedily we cure the fracture, and the ſooner the reduction of the joint is made, the better will it be both for the ſurgeon and patient, as the operation will be the more eaſily performed, and conſequently leſs painful.

From the rigidity of the muſcles and tendons, and conſequent immobility of the joint, when the bone has been long out of the ſocket, it has generally been ſuppoſed that an inſpiſſation of the ſynovia takes place, by which the reduction of the bone is at length rendered impracticable; but, on the diſſection of limbs where this has been imagined, no ſuch thing has ever been found to have happened. On the contrary, the joint has never been found to be filled up even with cellular ſubſtance, which is a ſuppoſition that

that has alſo gained ſome credit. It is the rigidity of the parts which alone oppoſes the reduction of old luxations. This we may underſtand from what happens in other caſes. In old people, for inſtance, and tender delicate perſons, luxations are eaſily reduced; while in vigorous people who uſe ſtrong exercife, as ſailors, blackſmiths, &c. the muſcles reſiſt very ſtrongly, and luxations cannot be reduced without conſiderable difficulty.

If any conſiderable degree of inflammation or ſwelling has taken place about the joint, before the ſurgeon is called, this muſt be removed before he attempts to perform the operation; but, in all caſes which have fallen under my care, there never was any obſtacle to the immediate reduction; neither indeed did I ever ſee any in which there was. A conſiderable degree of pain there certainly muſt be, from the unnatural ſituation of the parts; but this cannot be relieved by any means ſo effectually as by reſtoring them to their proper ſtate. In every diſlocation it is only the end of one bone that is moved out of its place, and always the under one of the two which forms the joint. Thus, in a diſlocation of the knee, it is always the tibia which is moved from its place; the lower end of the os femoris remaining as it was. Hence, it is evident, not only from the anatomy of the parts, but

but from common obſervation, that what moves the bone, the end of which is out of its place, muſt ariſe or originate from that bone or bones that ſtill retain their natural ſituation; and, of courſe, not only all the parts of the joint muſt be relaxed, but all the muſcles ſituated upon the bone, the end of which is diſlocated. The force, therefore, neceſſary to extend the limb, muſt be applied entirely to the under end of that bone which is diſlocated; while the joint below is bent, in order to relax the muſcles and tendons as perfectly as poſſible. This being done, and the body of the patient held firm, the extenſion is to be made by aſſiſtants, which will for the moſt part anſwer much better than any machine yet invented. Indeed, no ſurgeon ought ever to think of a machine till his own ſtrength, and that of his aſſiſtants, have totally failed.

In former times, many different kinds of machines were uſed for making the extenſion in diſlocated limbs, but none of them have been found to anſwer the purpoſe; or, at leaſt, they do not anſwer it without giving the patient a great deal of unneceſſary pain. Some of them are even ſo ill contrived, that the force of them cannot well be determined by the perſon who employs them; and of conſequence they may ſometimes do too little, at others too much, as the

the ſurgeon exerts himſelf leſs or more; neither have all the alterations that the moderns could make in theſe inſtruments been able to cure them abſolutely of their defects. Where bones are diſlocated, as well as when they are fractured, the reſiſtance to their reduction ariſes from the action of the muſcles, and from the manner in which they are entangled amongſt them, which ſometimes may be ſuch as to make reduction in a manner impoſſible, without a very complete knowledge of the anatomy of the parts, and the utmoſt attention to every circumſtance attending the accident; for ſometimes it is of the greateſt importance to be informed of the poſture in which the patient was when the accident happened. When this hpppens to be the caſe, it is vain to think of replacing the bone by force, though perhaps it may be done very eaſily by putting the limb in ſuch a poſture that the head of the bone can diſengage itſelf from the muſcles among which it is entangled. Nay, in the ſecond volume of the Medical Obſervations, we are told of a man received into one of the hoſpitals with a diſlocated ſhoulder, who, "after many fruitleſs attempts to reduce it by conſiderable and various extenſions, had the happineſs to be found one morning with his arm perfectly replaced; which I preſume," adds the author of the paper, "could happen no other way than by

by the head of the bone, in ſome lucky poſition of the arm, finding its way between the embracing tendons.

Where conſiderable extenſion is neceſſary, it ought always to be done gradually, and in ſuch a manner as not to make the head of the bone catch either againſt the edge of the ſocket, or againſt any of the contiguous parts of the bones towards which it may be forced. If the extenſion be made gradually, the muſcles will bear a very great force without any injury; but if a much leſs force than they can bear in this way be ſuddenly applied, incredible miſchief may be done by ſtraining them in ſuch a manner that they cannot afterwards recover their tone. "I know, ſays Mr Pott, that the vis percuſſionis, as it is called, has been recommended, as having been ſucceſsful in ſome difficult luxations; but I have ſeen ſuch bad conſequences from it, that I cannot help bearing my teſtimony againſt it." The extenſile and diſtractile quality of the membranes, muſcles, and ligaments, enables them to bear the application of very great force to them without hurt, if ſuch force be applied gradually, and proper time be allowed for the parts to give way in; but great force, ſuddenly applied, is capable of producing the moſt miſchievous conſequences; and that in many other parts

parts of ſurgery beſides what relates to luxations."

But, though a great force of extenſion is not to be ſuddenly applied, we are by no means from thence to conclude, that in all caſes we are to make a very ſlender effort for extending the limb in caſes of luxation. The example above quoted from the Medical Obſervations, indeed, ſhows us, that very much depends on the proper poſture of the limb; but there are caſes undoubtedly in which a conſiderable force muſt be uſed. It is impoſſible to define the preciſe degree; but we muſt always gradually increaſe the extending power, until the reſiſting force of the muſcles be overcome, the ends of the bone being freed from preſſing upon one another, and the head of the diſlocated bone be brought fairly in a line with the ſocket. During the whole time of the extenſion, the bone ought to be gently rolled, that it may paſs into the ſocket, which it will inſtantly do with a very ſenſible jerk, as ſoon as the extenſion is properly made, and the end of the bone brought oppoſite to its ſocket.

For the moſt part no bandage will be neceſſary in luxations after the joint is reduced, as the muſcles anſwer the purpoſe of keeping in the bone much more effectually than any bandage can do. For the moſt part, however, a conſiderable degree of pain, ſwelling, and inflammation,

takes place, but they generally abate in a ſhort time; though, in order to prevent any chronic or other affection of the joint, we ought to uſe topical blood-letting, either by leeches, or ſcarifying the part; applying alſo ſaturnine medicines, to abate the pain and ſwelling more quickly. During the cure, it will be neceſſary to keep the limb in a relaxed poſture.

Luxations, as has already been obſerved, are ſometimes complicated with wounds as well as fractures, though compound luxations are more ſeldom met with than compound fractures; it being much eaſier to drive the ſharp end of a broken bone through the integuments, than the obtuſe end of a bone which forms a joint. The method of treating them both, however, is the ſame. Compound luxations happen more frequently in the ancle and wriſt than in other joints, and there excite a very high and dangerous inflammation, eſpecially if the joint has been long expoſed, which is frequently the caſe in this kind of diſlocations. As ſoon, therefore, as the bones are replaced, the utmoſt care muſt be taken to prevent or abate the dangerous ſymptoms juſt mentioned, by applying leeches, and other means already pointed out. The wound ought to be dreſſed with ſimple cerate, and the dreſſings changed only when abſolute neceſſity requires it; but if, in ſpite of all our

endeavours, a ſuppuration ſhould come on, we muſt carefully prevent the matter from inſinuating itſelf into the cavity of the joint, by placing the foot in ſuch a poſture as to allow the matter to paſs out at the wound freely, and by dreſſing the wound twice in twenty-four hours, which will prevent it from collecting. During the dreſſing, we muſt likewiſe carefully take off the matter with a piece of fine ſponge dipped in warm water, and then ſqueezed out. The dreſſing ought to be performed every time as quickly as poſſible, and the wound afterwards ſecured from the air as well as we can, by which means we will prevent the bones from becoming carious, by the matter lying upon their ends, and deſtroying the cartilages. If a gangrene comes on, it muſt be treated as has already been directed.

It has already been obſerved, that luxations ſometimes take place from mere relaxation and debility of the ſurrounding muſcles and tendons. In this caſe we generally look upon them as incurable. Sometimes, indeed, the bones are removed out of their proper places by tumors, or by collections of matter. If theſe tumors or collections can be removed, we may then perhaps accompliſh a cure; but, where we cannot accompliſh this, the cure muſt always be more or leſs imperfect. In caſes of relaxation, we may

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try the effect of tonics, both general and topical, or we may keep the bones in their places by proper bandages.

## SECTION I.

### *LUXATIONS OF THE BONES OF THE CRANIUM AND HEAD.*

A Separation of the bones of the cranium moſt commonly takes place in conſequence of a collection of water in the head, though ſometimes it is occaſioned by external violence. In the former caſe, it always proves fatal; and I am perſuaded that neither ſurgeon nor phyſician can be of any ſervice. When the bones are forced from one another by external violence, we have been told that the patient may ſometimes be cured. I never met with an inſtance of this; nor do I think it poſſible, unleſs the ſubject has been very young. In young ſubjects, the ſutures are either not formed at all, or have very little firmneſs for ſeveral years.

Luxations of the whole head, or neck however, frequently take place; but, in order to underſtand how this may happen, we muſt, in the firſt

firſt place, take notice of the different motions which are performed by the head upon the neck. Theſe are of two kinds, viz. 1. forwards and backwards, which may be called the nodding motions. They are performed only by the motion of the condyloid proceſſes of the occiput moving in the glenoid cavity of the atlas or firſt joint; where, from the oblique poſition of the condyle, the articulating ſurfaces of them being placed laterally, and looking outwards, and the articulating ſurfaces of the atlas looking as it were inwards, or towards each other, ſo that the occiput is ſet down between them in ſuch a manner as to be ſecured on each ſide, and, by means of this obliquity of the joint, the head is prevented from turning round. 2. The rotatory motion, or turning round of the head, is performed by means of the proceſſus dentatus, upon which it turns.

The occiput and atlas are connected to one another, like other joints of the body, by means of capſules, or ligaments ſhaped like bags for each condyle, riſing from a rough ſurface on each vertebra, and fixed into a rough ſurface at the root of each condyle. There is likewiſe a flat membranous ligament, which extends from the inſide of the ring of the atlas to the ring of the occipital hole; which anſwers the purpoſes of cloſing up the ſpace betwixt the occiput and atlas,

atlas, and ſtrengthening the joint, as well as giving a ſmooth ſurface to the place through which the ſpinal marrow paſſes. Beſides theſe, we find the atlas connected with the dentatus by means of a more regular ſet of ligaments. 1. There are regular capſules betwixt them, as in other joints, by which the condyles, or bodies of the vertebra, are fixed to one another. 2. A ſtrong ligament runs acroſs the back part of the ring of the atlas, forming, as it were, a bridge; embracing the neck of the tooth-like proceſs, and ſecuring it firmly in its place. This ligament runs upwards to be fixed into the poſterior edge of the occipital hole into the dentata, ſo as to incloſe the tooth-like proceſs in a ſtrong capſule. 3. The dentatus has a ſmooth and cartilaginous ſurface round the root of the tooth-like proceſs, where it turns in the ring of the atlas, and is bound by a ligament; hence the rolling motion of the atlas on the axis of the the dentatus is ſo fair and proper a joint, that it is likewiſe included in a capſular ligament. 4. The back part of the ring of the atlas being, as it were, completely threaded with the tooth-like proceſs of the dentatus, which almoſt touches the back part of the occipital hole, where another ligament ties it firmly to the occipital bone.

From the manner in which the proceſſus dentatus is placed in the atlas, it is evident that nothing

thing prevents it from injuring the ſpinal marrow in its motions, but the ſtrong capſule and ligaments by which it is ſurrounded; and not only tied to the atlas; but, that the motions may be exactly regulated, its upper part is fixed by a ligament to the edge of the occipital hole internally, while its neck or root is ſecured by two flat ligaments, which runs obliquely upwards, to be fixed into a groove behind the ſame hole. Hence it appears, that every thing which injures theſe ligaments, or any one of them, either by relaxing, or entirely burſting them, ſo that the tooth-like proceſs is thereby ſet at liberty, may bring on inſtant death, or at leaſt it muſt happen in a very ſhort time; becauſe now there is nothing to hinder the ſpinal marrow from being injured by the proceſs in every motion it makes. From the very appearance of this joint alſo, and from the articulation of it with the atlas and occiput, it is almoſt demonſtrable, that no lateral injury done to the neck can either ſtretch or tear any of theſe ligaments within the atlas, or that by which the dentatus is tied within to the occipital hole, for the purpoſe of regulating its motions, and preventing it from doing any injury to the ſpinal marrow. The only way in which theſe ligaments can be overſtretched, or completely torn, (ſo that the joint may move with ſuch freedom as ſuddenly to deſtroy

deſtroy the patient), the only way, I ſay, in which this can happen, muſt be by any thing which ſuſpends and keeps the head firmly in its place, while the body is ſuffered to ſink with a jerk; and, in proportion to the weight of the body, the ſuddenneſs with which it is let fall, and the firmneſs with which the head is ſuſpended, will the injury be which is done to this joint. In ſome caſes, the atlas has been found completely drawn off from the head of the dentata, and thus a complete luxation formed, and all the ligaments torn. In other caſes, the ligaments have been found ſo much ſtretched, as to allow the proceſſus dentatus freely to compreſs the ſpinal marrow; and, in all theſe caſes, it is evident that death muſt unavoidably enſue, in ſpite of every aſſiſtance which art can give. This is the manner in which thoſe who are hanged expire; and, as the injury is commonly done by the firſt jerk of throwing them off, there are but ſmall hopes of recovering them, even by immediately cutting them down. In ſome, however, who have ligaments of an uncommon ſtrength, the joint may remain whole, and the perſon be recoverable, after being ſuſpended a very conſiderable time.

But, though total diſlocations of the head are always productive of inſtant death, partial ones may very frequently be cured by timely aſſiſtance.

ance. We will underſtand now how this happens, by conſidering the manner in which the condyles are placed within the glenoid cavity of the atlas, and obſerving that this cavity ſpreads out conſiderably towards its upper and poſterior part. Any injury, by which the head may be ſtruck forcibly on one ſide, and fixed in its ſituation, whilſt the body is thrown to the oppoſite one, may depreſs the condyle of the occipital bone (on the ſide oppoſite to that which received the ſtroke) to the very bottom of the glenoid cavity, by which means the other condyle will be much elevated, and its internal edge may be thrown over the brim of the atlas externally. If this were the ſituation, the following ſymptoms would then take place:

1. From the formation of the joint already deſcribed, the head muſt be turned to one ſide, and the chin hang down upon the breaſt. 2. From the preſſure of the inner edge of the condyle that has paſſed within the cavity upon the ſpinal marrow, the patient is inſtantly deprived of all ſenſe and motion, ſo that he lies, to appearance, quite lifeleſs; and, in this caſe alſo, would very quickly expire, if the reduction was not inſtantly made, of which there are many inſtances in falls from high places, and from horſes.

Every

Every luxation of the head, as has already been ſaid, muſt terminate fatally, of which I knew an inſtance of two gentlemen in the weſt of Scotland thrown from their horſes while in a ſtate of intoxication. Both of them died almoſt inſtantly; and, on diſſection, the joint between the head and atlas was found, in one of them, to be in the poſition already deſcribed. But we may, even without any diſſection, eaſily ſatisfy ourſelves from what takes place on the reduction, that the joint can only be diſlocated in the way I have mentioned. When a ſurgeon, therefore, is called to a patient, and finds him ſenſeleſs and motionleſs, with his head to one ſide, and his chin depreſſed, he ſhould inſtantly ſet him on the ground, while an aſſiſtant ought to ſupport his body. The ſurgeon muſt place himſelf on the ſide to which the head inclines, taking hold of the chin with one hand, and of the back and under part of the head with the other. In this way he pulls the head directly towards him with all his force, while the body is kept down by the aſſiſtant. This extenſion muſt be continued till the internal edge of the condyle, which, by the diſlocation, was thrown over the external edge of the glenoid cavity be again pulled into it. As ſoon as this is done, the head will be reſtored to its proper poſition with a ſudden jerk and noiſe; after which, generally in a few

minutes, the patient is reſtored to his ſenſes, and able to walk. Indeed, in caſes of this kind, if the patient be not abſolutely dead before any aſſiſtance is called, the natural functions will begin as ſoon as the preſſure is taken off from the ſpinal marrow; though it muſt be evident that the recovery of the ſenſes and ſtrength will be in proportion to the length of time which has intervened ſince the injury was received. If the patient does not begin to ſhow ſome ſigns of life ſoon after the bones are reduced, and warm friction has been uſed, it muſt be owing to too great a delay in performing the operation, by which means the long continued preſſure has deſtroyed all the functions of life. We ſee, therefore, the great danger there is in ſuch caſes, and the abſolute neceſſity there is for immediate aſſiſtance, ſo that whoever happens firſt to come to the patient, ought to attempt the reduction of the joint, whether he be a ſurgeon or not; for a profeſſed ſurgeon may be at ſuch a diſtance as to come too late, though he uſes all the expedition he can. If the patient feels much weakneſs after the reduction, he muſt be put to bed, with his head and ſhoulders ſomewhat elevated; leeches muſt alſo be applied all round the ſides and back of the neck in ſuch a manner as to prevent inflammation; the bowels ought alſo to be

be kept open by gentle cooling laxatives, and the diet regulated according to his ſymptoms.

From the anatomy of the two joints already deſcribed, and from the different ways in which luxations of the head are produced, one from ſuſpenſion by the neck, when the body drops with a great jerk or force, and the other in all caſes produced by falls from heights, we ſee that in the latter caſe the injury always takes place between the occiput and atlas. I have known three inſtances of people being thrown from their horſes when intoxicated, having their necks partially luxated in this way, and the bones being inſtantly replaced by a companion; on which they recovered ſo inſtantaneouſly, that they were ſet again upon their horſes, and rode home as though nothing had happened. The leaſt attention, therefore, to the ſtructure of theſe articulations may ſhow us, that any injury done to the ligamentous connections of the ſecond joint of the neck, as well as of the firſt with the occiput, muſt inſtantly produce an univerſal paralyſis, and ſudden death. This never fails to be the caſe with people who are hanged, when the ligaments are torn, and the proceſſus dentatus pulled out of the atlas; nay, even though the parts could be inſtantly altered to their natural ſituation, it is not in our power, by all the bandages

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we can uſe, to ſupply the want of one of theſe ligaments, ſo that the patient muſt always die.

## SECTION II.

### *LUXATIONS OF THE BONES OF THE NOSE, AND OF THE LOWER JAW.*

LUXATIONS never can take place in the bones of the noſe without fracture, which has already been fully treated of. In the lower jaw they are not unfrequent, and may ſometimes be occaſioned by exceſſive yawning, as well as by external violence. From whatever cauſe, however, this happens, the jaw can only be diſlocated in one way, viz. by the condyle ſtarting forward, till it is fixed exactly before and under the zygomatic proceſs. Sometimes the luxation takes place only on one ſide, but moſt commonly on both. When the luxation is complete, the mouth is opened very wide, and the chin thrown forwards and downwards to the breaſt; but, when only one ſide is diſlocated, the mouth is diſtorted and wideſt on the ſide oppoſite to that which is diſlocated; the jaw, in that caſe, inſtead of being puſhed directly down, is driven ſomewhat towards the oppoſite ſide.

Luxations

Luxations of the jaw, whether on one or both ſides, are attended with very conſiderable pain, which is very much aggravated by any attempt to ſhut the mouth, which yet can by no means be done. There is likewiſe a difficulty, or rather total inability of ſpeaking, and a difficulty of ſwallowing. Convulſions, and death itſelf, are ſaid to have been ſometimes occaſioned by a luxation of the jaw; but, if ever theſe take place, it muſt be owing to too great a delay in reducing the luxation; for, after this, nothing can happen which is not to be attributed to the neglect or miſmanagement of the ſurgeon. When a luxated jaw is to be reduced, the patient muſt be ſeated on a low chair, with his head backwards, and his face a little upward; the head being firmly ſupported by an aſſiſtant. The ſurgeon then places himſelf before the patient, and having drawn on his gloves, (to prevent any injury from the patient's teeth when the jaw is reduced), he introduces his two thumbs into the patient's mouth, along the molares on each ſide of the jaw, till the points of the thumbs reach the angle of the jaw on each ſide. Then, with his fingers, he takes firm hold of the jaw on each ſide; and thus, having a very firm hold, he, as it were, pulls the condyle of the jaw a little more forwards, till he finds it move, after which he inſtantly preſſes down the jaw with his thumbs, with

with great force, elevating the chin gently at the ſame time. On this, provided the thumbs have been made to preſs with force ſufficient to counteract the power of the temporal muſcles, the condyles will paſs into their ſockets, and the joint be reduced with ſuch force, that the thumbs would be very much bruiſed had they not been covered; and ſometimes are ſo, notwithſtanding all our care. We muſt proceed in the ſame manner, whether the luxations be on both ſides, or only on one; and, after the operation has been performed, we muſt enjoin the patient to refrain from ſpeaking much, from yawning, or opening his mouth wide on any occaſion. If he cannot avoid yawning, he muſt always ſupport the chin with his own hand, or have it ſupported with a bandage. The ſurgeon ought always to remove his thumbs as quickly as poſſible, as the patient bites involuntarily as ſoon as the reduction is performed, and the operator ſometimes thinks himſelf well off that he has not loſt them entirely. The uſual precaution taken in this caſe is only to wrap an handkerchief round them; but gloves of ſtrong leather anſwers much better; and a caſe of thin iron, covered with leather, will anſwer ſtill better.

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## SECTION. III.

### *LUXATIONS OF THE SPINE, OS SACRUM, AND COCCYX.*

THERE can be no complete luxation of the vertebræ without a fracture, by reaſon of their being ſo ſtrongly connected with one another, and with the ribs. Partial luxations, however, may take place, and are known by a diſtortion of the ſpine, and a paralyſis of all the parts below the injured part; ſometimes accompanied with an involuntary diſcharge of urine and fæces. By degrees the paralyſis of the lower parts of the body becomes more and more complete, and the patient ſoon after dies. On feeling the part, the luxation may be diſcovered by the fingers.

Partial luxations may be produced by violent blows, or falls from great heights, where the back ſtrikes acroſs a beam; or by the paſſage of heavy carriages over the body. Hence it ſeldom or never happens that the vertebræ are diſlocated outwards, but almoſt always inward, with an inclination generally to one ſide or other; and hence they are extremely difficult of reduction, becauſe we are impeded in our endevours

deavours for that purpoſe, by the viſcera contained in the thorax or abdomen. We are to make the attempt, however, by laying the patient over a cylindric body, ſuch as a large caſk; thus relaxing the ſpine as much as poſſible, and puſhing down at the ſame time the vertebræ as much as we can, and at the ſame time raiſing the ſuperior part of the body upwards. But, if the diſlocated bone, inſtead of being forced directly inwards, be puſhed to one ſide, we muſt then incline the body of the patient towards the other, and endeavour to puſh in the diſlocated bone in this manner. But, indeed, if the bone be much removed from its natural ſituation, we have no reaſon to hope for ſucceſs from this or any other method; and as for complete luxations of the vertebræ, they muſt always prove fatal in a very ſhort time, from the great injury done to the ſpinal marrow. Luxations of the os ſacrum are to be treated in the ſame manner with thoſe of the vertebræ.

The os coccyx is more ſubject to luxations than the vertebræ or os ſacrum, and may be diſplaced either outwardly or inwardly. In laborious births, we are told that it is ſometimes forced outwards, particularly where great force has been uſed in extracting the child's head. This injury may be ſuppoſed to exiſt, when after delivery the patient complains of a ſevere pain

ſtriking over the region of the loins, eſpecially at the junction of the os coccygis with the ſacrum; and particularly, if, upon examination, the os coccygis be found to project, and appears looſe. To reduce diſlocations of this kind, the ſurgeon muſt oil the fore and middle fingers of his right-hand, and gently introduce them into the rectum, laying hold of the coccyx internally with them, and externally with the thumb. Thus we are to preſs and pull down the bone as much as poſſible, preſſing, at the ſame, the upper and diſlocated end into its place with the left-hand. It will always be neceſſary to ſupport the parts for ſome days with compreſſes and the T bandage; which, in every caſe of this kind, anſwers the purpoſe better than any other.

But beſides this mode of diſlocation, the os coccygis is liable to be driven inwards by falls or violent blows. In this caſe the patient complains of ſevere pain and teneſmus, from a ſenſe of fulneſs in the rectum, while the fæces paſs with difficulty, and, at times, there is a ſuppreſſion of urine; and, in general, the injury will be diſcovered by examination with the finger. In the reduction we muſt follow the method recommended in external diſlocations; remembering only, when the extenſion is made, to pull the bone outwards, till we find that it has regained its place. In luxations of the coccyx we often

often meet with a conſiderable inflammation, and the utmoſt care muſt be taken to prevent it from ending in ſuppuration, which here would prove very dangerous. The methods proper to be followed have already been pointed out under the head of inflammation; but here we muſt particularly attend to the ſtate of the patient's bowels; he ought to be laid in an horizontal poſture, on his ſide, and his diet ought to be of the moſt cooling kind.

## SECTION IV.

### *LUXATIONS OF THE CLAVICLES.*

THESE bones are much more liable to fracture than luxation; though both ends of them may alſo be diſplaced, either at the acromion or ſternum; and, in ſuch a caſe, the injury may be eaſily diſcovered by the pain and immobility of the joint, and by the riſing up of the end of the bone. There are inſtances, however, of a luxation of the clavicle being miſtaken for one of the ſhoulder; but this can never happen to any ſkilful practitioner, or one who is acquainted with the anatomy of the parts; beſides that, it may be

be eaſily diſcovered by the ſymptoms themſelves, and the appearance of the part. In a diſlocation at the acromion, the end of the ſcapula being detached, ſticks up conſiderably, with a cavity immediately above the joint; and upon examining the joint of the ſhoulder, it will be found of its natural ſhape. On bending the fore-arm, and rolling the os humeri, the head of it will be found in the ſocket as uſual; and the patient will alſo be able to move his arm, though with more pain than formerly.

On attempting to reduce any diſlocation of this kind, we ought to draw the arms and ſhoulders conſiderably backwards, by an aſſiſtant; while the ſurgeon preſſes the end of the bone into its place with his fingers. The arm muſt be ſupported after the operation in the leather machine, by which the ſhoulder will be a little raiſed; and, by the aſſiſtance of a ſmall compreſs placed over the elevated part of the clavicle, ſecured by bandage forming the figure 8, the bones will be kept in their place.

But in thoſe caſes where the clavicle is ſeparated from the ſternum, we muſt purſue a quite contrary method. Here the elevation of the ſhoulder, and ſupporting the arm too high, always have a tendency to throw the bone out of its place. Still, however, the arm muſt be ſupported, but we muſt do it in ſuch a manner as

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to allow the ſhoulder to retain its natural ſituation. It will alſo be uſeful to keep the head firmly in an erect poſition, which may be done by the inſtrument repreſented Pl. 9. Fig. 2. Vol. II. the ſtraps of which are applied over the ſhoulder and upper part of the trunk, as far as the diſlocated end of the bone. Thus the head is ſupported, the ſhoulder kept back, and the end of the bone retained in its place; whilſt, at the ſame time, the patient may have the free uſe of his arm reſtored; but, unleſs the bandage be continued for a conſiderable time, the end of the bone will be again apt to ſtart out of its place, and the patient will be as bad as ever.

## SECTION V.

### *LUXATIONS OF THE RIBS.*

THE ribs, by their ſituation with regard to one another, and their connection with the vertebræ, are ſo ſecured in their places, that a luxation of them is barely poſſible. When it does happen, it can only be inwards, and muſt be occaſioned by ſome violent blow very near the articulation; for in any other place a fracture, without any luxation,

luxation, muſt be produced. Nay, even ſuppoſing this to have happened, and the end of the bone connected with the vertebræ to have been moved inwards from its place, the natural elaſticity of the rib itſelf, its connection with the ſternum, and the preſſure of the viſcera outwards, would, in almoſt all caſes, except where complicated with fracture, reſtore the diſlocated end to its former poſition as ſoon as theſe cauſes were at liberty to act. But, ſhould we meet with any patient to whom this injury had happened, and in whom the ſpontaneous reduction was by ſome means prevented, we might diſcover it by the feel; for, where the rib had been ſeparated from the vertebræ, there would be an evident hollow. The other ſymptoms would be the ſame with thoſe of fracture, viz violent pain, but chiefly at the articulation, difficult reſpiration; and, if the end of the rib had pierced the ſubſtance of the lungs, a ſpitting of blood or emphyſema, or both, would take place.

In luxations of the ribs, we muſt follow the ſame method recommended in fractures, and which can conſiſt in nothing elſe than aſſiſting the viſcera to preſs the bone outward as much as poſſible, as we have no acceſs to it with our hands. After the reduction is completed, the bone has not the ſame tendency, as in other parts, to ſlip away from its articulation; for the

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ſame cauſes which render the luxation ſo difficult at firſt, undoubtedly contribute to prevent it from happening again. Hence, we cannot derive the ſame aſſiſtance from bandages as in other caſes. Inſtead of this, they appear to be rather injurious, by unneceſſarily increaſing the preſſure againſt the ſore and wounded parts. All that is neceſſary to be done in this caſe is to keep the patient quiet, to abate the inflammatory ſymptoms by the methods formerly recommended, and to appeaſe the cough, if very troubleſome, by opiates, until the perſon gets well.

## SECTION VI.

### *LUXATIONS OF THE SHOULDER JOINT.*

THIS joint, as we formerly obſerved, is poſſeſſed of the moſt free motion of any in the body, owing to the large ſize of the ball of the humerus, and the ſhallowneſs of the glenoid cavity of the ſcapula in which it moves. For the ſame reaſon, therefore, it is more than any other expoſed to luxations. From the formation of the ſcapula, it is impoſſible that the os humeri can be luxated upwards without a fracture of the acromion,

acromion, or coracoid proceſſes, or both, which does not very often happen. Hence, the humerus is luxated principally in two ways: 1. When the head of the bone is puſhed down into the axilla, in which caſe the arm cannot be brought cloſe to the ſide. As the deltoid muſcle is now unſupported by the humerus, the joint becomes flat, and the ſhoulder loſes its natural fulneſs and rotundity; the luxated elbow hangs lower than the other, and the arm cannot be raiſed nearly to a line with the acromion, without giving the patient great pain; and, in diſlocations of this kind, the head of the bone is eaſily felt in the armpit. 2. The bone may be forced downwards till it be diſengaged from the ſocket; after which, it is retracted upwards and forwards, ſo that it is almoſt always felt lodged in the upper and anterior part of the armpit, above the edge of its ſocket, and ſomewhat forward under the edge of the great pectoral muſcle, where it may be eaſily felt to roll, particularly if the arm be made to roll a little upon its axis, and the left hand placed upon the forepart of the joint; and here the ſame defect in the plumpneſs and appearance of the joint takes place as in the other. 3. There may be inſtances where the head of the bone has been forced downwards and backwards, where its head is lodged behind and under the ſpine of the ſcapula. In this caſe, the elbow is puſhed a little forward, and acroſs the body,

body, whilſt the head of the bone is thrown backwards. Here alſo, when we roll the arm a little upon its axis, the head of the bone will be felt to move under the ſpine of the ſcapula in the ſame manner as under the pectoral muſcle.

In recent luxations of the humerus, the reduction is for the moſt part ſo eaſy, that it ſeems in a manner impoſſible not to accompliſh it, particularly when the bone is lodged in the armpit; but, when under the pectoral muſcle, it is evident that all the ſhort muſcles inſerted near its head muſt be much injured; the ſupra and infra ſpinatus particularly muſt be very much ſtretched, and in ſome caſes partly lacerated. Thus only can we account for the violent pain that takes place, as well as from the preſſure made by the head of the bone upon the axillary nerves and blood-veſſels. In the Medical Tranſactions, vol. 2d, we have an account of a caſe of luxation of the os humeri, which ſeems to have been one of the moſt difficult that could happen. The patient was a man of fifty years of age, who had been hurt by the recoil of a wheel with which he was twiſting a rope. On examining the ſhoulder, a conſiderable hollow was found below the acromion, where the head of the humerus ought to have been; the elbow was ſomewhat elevated and turned outwards, and could not be brought cloſe to the ſide,

and the middle of the arm had an apparent curvature. On raiſing the arm, and paſſing the fingers into the axilla, the head of the humerus was found to be lodged there, conſiderably high up. The reduction was attempted by Mr Thomſon, ſurgeon to the London Hoſpital, firſt with the hands, and afterwards by the heel, (a method to be afterwards deſcribed), but without ſucceſs. It was then reſolved to delay any farther attempt until the tenſion and pain ſhould abate; but the patient, being unruly, managed himſelf ſo ill that he caught cold, fell into a fever, attended with ſore throat, and died on the 18th day. An opportunity was now offered of diſſecting the joint, and thereby obſerving with accuracy the obſtacles which had prevented the reduction. The deltoid muſcle was found to be conſiderably ſtretched and tenſe, which had thus occaſioned the appearance of curvature in the middle of the arm, by the head of the humerus being ſo far removed from its place. The coraco-brachialis was alſo ſomewhat tenſe, but the broad head of the biceps was relaxed, the long and round head of the ſame muſcle made a large curvature; and, being thereby violently ſtretched and diſtorted, occaſioned an inſurmountable flexion of the fore arm; "a proof, ſays Mr Thomſon, of the impropriety of making any manner of extenſion of the fore arm in theſe

caſes, which ought to be bent as much as poſſible, to relax that part of the biceps which might otherwiſe have been an hindrance to the reduction."

On the removal of the deltoid, pectoral, and coraco-brachial muſcles, together with the broad head of the biceps, the latiſſimus dorſi, and teres major, from their attachments at the humerus and ſcapula, the tendinous expanſion of the ſupra and infra ſpinatus appeared in a ſtate of great tenſion; while that of the teres minor was relaxed at the time that the arm hung down by the ſide of the body. An irregular ſubſtance was obſerved under this expanſion, feeling like ſeveral looſe pieces of bone, and extending about two inches downward upon the humerus, which was moveable both inwards and outwards. On cutting tranſverſely through the upper part of the tendinous aponeuroſis, as well as the capſular ligament, &c. the head of the ſcapula came in view, which was in a natural ſtate, and the bony maſs was found to conſiſt of ſeveral fragments of broken bone blended with a fleſhy ſubſtance, and united at its lower part with an exoſtoſis, which had ſhot out from the body of the humerus, and of neceſſity was broken through in turning the piece downwards. The upper part of the body of the humerus, as far as it could be ſeen, was ſplintered. The head of the bone

bone itſelf was lodged on the inſide of the neck of the ſcapula, at the root of the coracoid proceſs, between the ſubſcapularis and ſerratus anticus major; but the blood-veſſels and nerves were not compreſſed by it. It was ſurrounded by the adipoſe membrane, the inſide of which, immediately incloſing the head of the bone, appeared to be a poliſhed membrane, made uneven by ſeveral bridles running croſſwiſe, and then by forming irregular cavities between them, in which was contained a ſmall quantity of mucus reſembling the ſynovia of the joints. On continuing the diſſection, it appeared that the capſular ligament had been completely torn from the whole circumference of the neck of the humerus, no remains of it being left but a few fringes, denoting its former attachment.

That difficult caſes of this kind may ſometimes occur is not to be doubted; but I am ſorry to ſay that I have often known practitioners either ſo negligent, or ſo ignorant, that, after having examined ſeemingly with all the care they could, the ſtate of the joint, and ſituation of the head of the bone, it was upwards of three months before they diſcovered the truth; after which, it was perhaps too late to apply any remedy. In young ſubjects, and where the luxation is recent, the patient is to be placed in a chair of a proper height, the ſurgeon muſt bend the

the fore arm, and lay hold of the limb a little above the elbow, making an aſſiſtant take firm hold of the patient's ſhoulder before and behind. Thus, the arm is to be gradually extended, until the ſurgeon has exerted all his force if neceſſary. If thus the head of the bone be freed, by bringing it into a line with the ſocket, it will fall into its place at once. In this way I have ſeveral times ſucceeded; but, as ſometimes more force may be neceſſary than the ſurgeon, even with the help of an aſſiſtant, can exert, we muſt then proceed in the following manner. Having firmly ſecured the body of the patient, and holding the ſcapula very firmly in its place, we muſt apply laces to the under part of the body of the humerus, which, without ſlipping over the elbow joint, may admit of very ſtrong extenſion, care being taken all the time to keep the elbow joint bent, in order to relax the muſcles as much as poſſible. The extenſion, however ſtrong, muſt be continued, until the head of the bone come into a line with the edge of the ſocket; for, till this be done, the luxation can never be reduced; but, as ſoon as this is done, the bone, by the action of the ſurrounding muſcles, will paſs into its place with a very conſiderable jerk or ſtroke.

From attentively conſidering the method juſt now recommended, and comparing it with what has

has been ſaid upon luxations in general, we may ſee how very erroneous moſt of the methods formerly in uſe have been; why they ſometimes could not ſucceed at all, and never could do ſo without giving the patient a great deal of unneceſſary pain, beſides the danger of overſtretching and weakening the muſcles, in ſuch a manner that they could not for a long time recover themſelves. I ſhall now make a few obſervations on ſome of theſe methods.

1. It has been attempted to reduce luxations of this kind, by applying a rolling pin to the axilla, and with it endeavouring to force the head of the bone upwards into the ſocket. To prevent the ſkin from being abraded, or the muſcles hurt by this hard body, directions have been given to cover it with flannel, particularly that part which paſſes under the axilla. But this method is liable to much greater objections than what can ariſe from the hardneſs of the roller; for, by forcing the head of the bone directly upwards, we preſs it into the cavity, below the neck of the ſcapula, thus counteracting, as far as the preſſure of the roller can, the effects of the extenſion of the arm, which thus muſt be made much ſtronger than would otherwiſe be neceſſary. Beſides, though ſome uſe the roller in all caſes indiſcriminately, it is plain, that, unleſs the head of the bone be forced directly,

rectly down into the axilla, it cannot have any effect at all.

2. The method of operating with the heel, formerly mentioned, is similar to that of the rolling pin. When reduction of a luxated shoulder is attempted by this method, the patient is laid on his back on the floor; the surgeon sitting on the same, puts the heel of his foot corresponding to the luxated shoulder into the armpit, pressing the head of the bone strongly upwards, while, at the same time, he extends the arm strongly with both his hands, laying hold of it at the wrist; as the posture he is in cannot admit of his grasping it conveniently above that joint. Sometimes we are directed, when the bone has been driven directly down into the axilla, to put some hard and round body, such as a tennis-ball, between the heel and axilla. This makes the method still more similar to that of the rolling pin; but, in whatever way we proceed, it must certainly be very exceptionable; for, 1. By laying hold of the arm below the elbow joint, we stretch and are in danger of hurting that joint. 2. By the yielding of the ligaments of the elbow joint, we lose a great deal of force which ought to have been spent on the humerus; and are thus obliged to use a much stronger extension than would have been necessary. 3. By extending the fore arm we put a number of muscles

muſcles upon the ſtretch, which ought always to be kept in a ſtate of relaxation, and thus greatly impede the reduction of the bone. 4. It is evident, that by puſhing with the heel, as well as with a rolling pin, we puſh the bone not into the ſocket, but into the neck of the ſcapula; and thus, inſtead of forwarding the reduction of the joint, we hinder it as much as in our power.

3. The patient being properly ſeated, ſome attempt the reduction in the following manner. The body is fixed by a long cloth put round it, and held firm by aſſiſtants, while the arm is extended by a couple of towels doubled and put round above the elbow joint. While the extenſion is made by means of theſe towels, it has been cuſtomary to uſe a towel or girth with the ends tied together, ſo that it forms a kind of loop, through which the arm is put; and by drawing the body of the towel ſtrongly upwards, a preſſure is made upon the head of the bone, ſimilar to that of the rolling pin or heel already deſcribed, and liable to the ſame objections. In this method the ſurgeon puts his own head through the loop of the towel, by which means he can ſtrongly force it againſt the bone in the axilla. But in whatever manner we make the preſſure, it is evident that the application of any force to the head of the bone before the extenſion is fully made, we can only preſs it againſt

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ſome part of the ſcapula, and thus impede the reduction. If the extenſion be fully made, there is then no uſe for any force, becauſe the action of the muſcles will of itſelf replace the bone. The injury done to the ſoft parts by theſe violent methods is likewiſe a matter of no ſmall importance. I have been witneſs to ſeveral caſes where the heel had been uſed, and where the inflammation ran to ſuch an height that it required the utmoſt care and attention to prevent a mortification; and yet, for all the trouble the ſurgeon had been at, and the pain he had given the patient, the bone ſtill remained diſlocated. Indeed, although methods of this kind may ſucceed in relaxed habits, or, as I may ſay, in feminine conſtitutions; yet I will venture to affirm, that in vigorous and young ſubjects, they will fail in nine caſes out of ten.

4. The inſtrument called the *ambæ*, or *ambi*, has been in uſe ever ſince the days of Hippocrates; and one kind of it takes the name of that celebrated phyſician, being called the *ambæ of Hippocrates*. This is no more than a ſimple lever moving upon a fulcrum, raiſed to a proper height, while the patient is ſo ſeated that the ſhort arm of the lever goes under his axilla, and by the force applied to the other violently, preſſes up the head of the bone. This, it is plain, differs not from the rolling pin, heel, or towel,

any other way than in mere force; for it preſſes the bone directly upwards, and what is worſe, unalterably ſo, becauſe we cannot give any motion to a lever, but what the play of it upon its fulcrum will allow. We may, indeed, increaſe the power of it to that of ten or twenty men if we pleaſe; but in proportion as the power of the machine is increaſed, in like manner alſo is the preſſure of the bone againſt the ſcapula; ſo that by making the lever act violently, the reduction may at laſt be rendered impoſſible without breaking the ſcapula.

5. Some have raiſed their patient to ſuch an height from the ground, that his arm could paſs over the uppermoſt ſtep of a ladder, which this was made to preſs upon the axilla; and the patient being ſecured in this poſition, the ſeat on which he ſat was ſuddenly withdrawn, ſo that he remained ſuſpended by the arm, with the ſtep of the ladder preſſing the bone upwards, more or leſs in proportion to his weight. This method, it is evident, is no other than a very rough and terrifying way of uſing the rolling pin; and therefore we need ſay no more about it. A door has been uſed inſtead of the ladder, but the method is now generally laid aſide.

6. Some have attempted the reduction of a diſlocated ſhoulder by raiſing the patient's body, by means of pullies acting upon the injured arm,

till he was nearly ſuſpended; then ſuddenly letting him down upon the ſhort arm of the ambe, they endeavour to replace the bone by means of that machine. This again is only the application of the rolling pin with a ſudden jerk, and is evidently worſe than any of the former, inaſmuch as the force, inſtead of being gradually, is ſuddenly applied, and thereby much more liable to do miſchief than if it had been otherwiſe.

Thus far we ſee, that however practitioners may have varied their means, they uniformly proceeded on the ſame principle, and that a very abſurd one, viz. to reduce the head of the os humeri into its ſocket, by preſſing it directly againſt ſome other part of the ſcapula; nay, to add to the abſurdity, a violent preſſure is made on the axilla to reduce the bone, whether it be there or not. Some, however, have avoided the abſurdity of attempting to replace the bone in this way, and therefore have tried more extenſion; though in more violent and aukward ways than what I have recommended.

7. The moſt gentle of theſe methods is to lay the patient down upon the floor, while two or three ſtout men, ſtanding upon a table, take hold of him by the arm, and pull him up from the floor.

8. On a ſuppoſition that the extenſion could not be made ſufficiently ſtrong by methods of this

this kind, pullies and ropes have been applied to give what was reckoned a ſufficient degree of force. Machines of this kind are not very eaſily applied, and if there be occaſion for machinery, a ſimple lever will give every degree of force that any combination of pullies can give.

9. In the Medical Obſervations, vol. 2d, we have an account of another method of reducing diſlocated ſhoulders by Mr White, ſurgeon to the Mancheſter Infirmary, without making uſe of an ambe at all. This method is applicable, he ſays, to luxations of ſeveral months continuance, where other methods had been employed without ſucceſs; but of the utility of the new method he gives three inſtances. The firſt was a man upwards of ſixty, whoſe right ſhoulder had been diſlocated for two months, and which a ſurgeon of great experience had ſeveral times attempted, though unſucceſsfully, to reduce, before he applied to Mr White. On examining the ſhoulder, it was found that the head of the os humeri had paſſed beyond the coracoid proceſs, and lay under the pectoral muſcle. Mr White having firſt attempted, without ſucceſs, to reduce it by means of pullies, and with the heel, which ſet him upon conſidering what might be the obſtacles. It then occurred, that the capſular ligament might have been torn while it was upon full ſtretch, the head of the bone have paſſed

paſſed through the laceration, and the ligament itſelf collapſed about its neck. If this was the caſe, he apprehended that the beſt method would be to put the limb into the ſame poſition it was in when the accident happened, and to make the extenſion in that poſture. The patient, however, having been very much in liquor at the time the accident happened, no information could be obtained from him. Mr White, however, was ſatisfied from his knowledge of the anatomy of the part, that the luxation of the humerus is ſcarcely poſſible when the arm makes an acute angle with the trunk of the body; ſo that the accident in queſtion muſt have happened, either when the arm made an obtuſe angle with it, or when it was raiſed almoſt into an erect poſition. From conſidering this, he was induced to try the following method: Having ſcrewed an iron ring into a beam at the top of the room, he fixed one end of his pullies to it, while the other was faſtened to the wriſt of the diſlocated arm by ligatures put about the wriſt, and placing the arm in an erect poſition. Thus he drew up the patient until his body was fully ſuſpended; but, that the wriſt might not be ſtrained, he, at the ſame time, cauſed two other perſons ſupport the arm above the elbow. Then, attempting to conduct the bone into its place, he felt it give way, and on hearing it ſnap, he concluded

cluded that it muſt have gone into its place. Having now taken down the patient as carefully as poſſible, he found that though the bone had changed its ſituation, it had not yet ſlipped into the ſocket; however, he now conceived hopes that the head had at firſt paſſed through a laceration of the burſal ligament, but was now brought back through the ſame, and might therefore be reduced by any of the common methods which had proved ineffectual before. Accordingly on trying the method with the heel, he now found not the leaſt difficulty, and the patient in a few weeks recovered the uſe of his arm. In the ſecond caſe, the luxation was of three months date, and its reduction had been unſucceſsfully attempted by ſeveral ſurgeons. On raiſing up the patient, however, by means of pullies, as already mentioned, the bone inſtantly ſlipped into its place, and the uſe of the arm was recovered a ſhort time after. The third caſe was only of a fortnight's ſtanding, but the bone was diſlocated in a very uncommon manner. The patient had little or no pain either in the place upon which the blow was received, or in any other part of the joint. He was, however, affected by a very violent pain about four fingers breadth below the articulation, exactly where the deltoid muſcle is inſerted into the humerus. His arm lay cloſe to the body; the leaſt elevation of it increaſed the pain;

pain; and it plainly appeared, by the ſcapula being puſhed a little outwards, that the head of the humerus lay below it. The common methods of reduction, particularly that by the heel, were tried in vain; on which, as Mr White had not now the pullies with him, he ordered three or four men to ſtand upon a table, and raiſe the patient up by his diſlocated arm, placing it in an erect poſition, until the whole body ſhould be ſuſpended. Endeavouring then to help the head of the bone into its ſocket, he perceived it give way conſiderably; and found, upon letting the patient down, that though the bone was not in its place, it had changed it place conſiderably, and was now entirely in the axilla. Concluding, then, that it might be very eaſily reduced by any other method, he tried the reduction by the heel, and inſtantly ſucceeded.

Theſe three caſes certainly prove that Mr White's method will *ſometimes* ſucceed. Concerning its general utility, and preference to other methods, I ſhall quote his own words: "This method, (ſays he), is, in reality, attended with much leſs pain than many others which are frequently practiſed; notwithſtanding, it may ſeem ſevere to perſons unaccuſtomed to operations of this nature; for, as no force is uſed about the ſhoulder to make a counter-extenſion, the patient is not ſubject to theſe troubleſome excoriations

excoriations and contuſions which but too commonly take place in the other methods; and I am every day more and more convinced, that a much leſs force will be neceſſary than is generally uſed; not only in caſes ſimilar to the above, but in diſlocations of other joints, if a proper regard be had to the nature of the articulation, and to the poſition of the limb at the time the accident happened." All this may be true, but it will not follow, that, becauſe other methods are worſe, that therefore this muſt be a good one. It is liable to the ſame objection to which all machinery is, and muſt be liable, viz. that it can make an extenſion only in a particular direction; whereas, the arm ought to be extended in different directions, according to the different poſition of the luxated bone. Hence, no machine can be applicable, except to a few caſes, and the indiſcriminate uſe of any one may be productive of much miſchief.

10. An improvement has not long ago been made upon the ambe of Hippocrates by Mr Trake, ſurgeon at London; but, without giving any particular deſcription of this machine, we may only obſerve, that neither it nor any other can be of uſe, except to make a ſtrong extenſion; and this might as eaſily be done, by having more aſſiſtants. It is alſo certain, that, in all all caſes, even in working with things altogether inanimate,

inanimate, the human hand is preferable, where it can be uſed, to every kind of machine. There is always a ſtiffneſs in machinery which cannot be overcome. Hence the immenſe difference between muſic played by machinery, and that by the hand. Even in the grinding of optical glaſſes, where we ſhould think that machinery might be applied with the greateſt advantage, we find that the caſe is otherwiſe. It is impoſſible to grind a ſpeculum ſufficiently exact for a teleſcope by any machine hitherto invented. Why then ſhould not the hand be preferred to machines in operating upon the human body, eſpecially as the hand of one man is generally ſufficient?

11. I have already obſerved, that, in every caſe of recent diſlocation of the humerus, the bone may be reduced without uſing a very violent effort; and I now add, that it is the ſame with thoſe of ſeveral weeks ſtanding. When the head of the bone is lodged in the armpit, the patient ought to be ſeated on a chair, having a ſtrong leather bandage well buffed, and fitted to the ſhoulder, ſo that it may fully keep back the ſcapula. Pl. 2. Fig. 9. repreſents the bandage A, a buckle fixed immediately at the top of the ſternum. B, another buckle, immediately over the under cervical, and uppermoſt dorſal vertebræ. C, a third buckle, immediately in a line with

with the præcordia. D, a fourth buckle, placed behind. E, E, two ſtrong ſtraps of girthing, with leather ſtraps at each end, fitted to the buckles. We muſt adapt the opening exactly to the ſhoulder joint, by means of three ſmall ſtraps with oppoſite buckles, placed on the top of the ſhoulder in ſuch a manner that the bone may move freely in every direction, while the ſcapula is firmly fixed in its place. One of the ſtraps of the girthing muſt afterwards be put round a poſt, or through a ring, fixed by a ſcrew, into a firm wooden wall. This ought to be exactly in a line with the uppermoſt buckles, to which each end of it is to be buckled, the one before and the other behind. The other ſtrap is to be paſſed round the ſame poſt, or through another ring, fixed in the ſame way, in a line with the under buckles, and to which each end of the ſtrap is to be buckled. In this way, it is evident that both ſcapula and trunk muſt be firmly and eaſily ſecured. After having fixed the body in this way, we are then to apply, to the under end of the humerus, ſuch a bandage as will admit of different laces, which, though pulled with a great degree of force, will not loſe its hold. Two pieces of girthing, each a yard long, are to be put on, one upon the outſide, and the other on the inſide of the humerus, both being firmly fixed to the arm by a circular bandage about an

inch broad, laid firmly round from the condyles of the humerus to the inſertion of the deltoid muſcle. Having firmly ſecured both pieces of girthing in this manner, the upper and under ends of the one on the outſide are to be firmly tied together, and the other on the inſide muſt be tied in a ſimilar manner. We are then to put through the under part of each ſtrap, thus tied, two pieces of ſtrong cord, each three yards long, in ſuch a manner that each half of the two cords may be equal. The fore arm is then to be bent, ſo that the muſcles may be relaxed; and, having thus prepared every thing, we are to give the two cords to as many aſſiſtants, whoſe feet are ſupported by a piece of wood nailed to the floor to prevent them from ſlipping. In this way, they are to make the extenſion gently at firſt, but ſteadily, and to continue gradually increaſing their force, until at laſt they have exerted their whole ſtrength. The extenſion ought to be made ſo that the arm may make an oblique angle with the body, by which means the head of the humerus will be pulled out from the neck of the ſcapula, and freed from the edge of the ſocket; and, as ſoon as the extenſion is complete, the bone will replace itſelf with a conſiderable jerk.

If two aſſiſtants have not ſtrength ſufficient to make the extenſion, more muſt be employed,

ſtill

ſtill remembering that it muſt be done gradually, and continued until any adheſions that have taken place give way; and, during the extenſion, the ſurgeon ought always gently to roll the head of the bone, holding the wriſt firmly in one hand, and the elbow joint in the other. But, when the head of the bone is puſhed downwards and forwards, and lodged below the pectoral muſcle, the arm ſhould be raiſed only to about a right angle with the body, whilſt the extenſion is made in an oblique direction, or rather at an obtuſe angle with the ſame, and the extenſion continued, gradually increaſing the force, until every obſtacle be overcome, and the bone reduced to its natural ſituation. The direction in which we extend the arm, indeed, muſt be varied according to circumſtances, particularly if the reſiſtance be very great. At any rate, it muſt be obvious, that any degree of force may be applied by increaſing the number of aſſiſtants, while, at the ſame time, there is no likelihood of any bad accident happening, ſuch as ſometimes take place when ſtrong machinery is made uſe of. Indeed, in upwards of twenty caſes of diſlocated humeri that have fallen under my obſervation, I have always ſucceeded to my wiſh; nay, I could even venture to ſay, that extenſion done in the manner I have directed will ſucceed, when that by machinery will fail. Every thing

neceſſary

neceſſary for this mode of operating may be eaſily procured, and in moſt caſes may be ſucceſsfully employed without any medical aſſiſtant. If, after the operation, any conſiderable degree of inflammation ſhould take place, it muſt be removed by the application of leeches, and other topical remedies formerly directed. If, as it frequently happens, when the ſame joint has been repeatedly diſlocated, the bone ſhould be apt to ſlip out of its place, the only method is to ſuſpend the fore arm in a ſling, as repreſented Pl. 1. Fig. 5. and to retain it in this poſition, until by bliſtering, friction, with ſtimulating medicines, and unctuous applications, as well as pouring cold water upon the part from the ſpout of a tea-kettle, the ſtrength of the joint ſhall be fully reſtored.

## SECTION. VII.

### *LUXATIONS OF THE ELBOW JOINT.*

THE motion of this joint, in its natural ſtate, appears more like that of an hinge, than any other in the body. It is poſſeſſed of flexion and extenſion

extenſion in the moſt perfect manner, without any mixture of lateral or rotatory motion. Hence, poſſeſſing leſs freedom than other joints, it is alſo leſs liable to luxations. It nevertheleſs can be luxated but only in one way, unleſs the olecranon be fractured at the ſame time; that is, when the bones of the fore arm are forced backwards and upwards, the lower end of the humerus being at the ſame time forced forwards and outwards upon the ulna and radius. In ſome few caſes, the bones of the fore arm have been thrown forward, whilſt the head of the humerus has gone proportionably backward; but, from the formation of the joint, it is evident that ſuch an affection can never take place without fracturing the olecranon.

When the elbow-joint happens to be luxated backwards, its motion is totally deſtroyed, the fore arm is conſiderably ſhortened, and a very ſevere pain takes place; whilſt the end of the humerus is found in the bend of the arm, the olecranon and the body of the joint is plainly felt behind. For the reduction, we muſt ſeat the patient firmly in a chair, whilſt an aſſiſtant takes hold of the humerus a little above the condyle; and the ſurgeon, bending the fore arm, takes a firm and ſtrong hold of the wriſt with his left hand, graſping with equal firmneſs in his right hand the arm, as near the projected end

of

of the humerus as poſſible. This being done, the aſſiſtant muſt be directed to pull the humerus ſtraight upwards, while the ſurgeon depreſſes the upper end of the fore arm with all his force; ſtill gently increaſing the flexion of the joint, while, at the ſame time, he pulls the bones of the fore arm forwards; and as ſoon as the extenſion has been properly made, and the ends of the bones completely freed from one another, the reduction takes place with conſiderable force.

When the bones of the fore arm are thrown forward, and the end of the humerus backwards, the cavity of the joint is upon the internal ſide of the arm, and the olecranon is always fractured, and may be felt grating, not only upon itſelf, but upon the trochlea of the humerus. Here both ſurgeon and aſſiſtant are to follow exactly the ſame method recommended in the former caſe; only that the ſurgeon, after having made the extenſion, inſtead of pulling the arm forwards while he elevates the fore arm, ſhould gradually puſh it backwards; and thus the bones will inſtantly be reduced. As in this ſpecies of luxation, however, the olecranon is always fractured, inſtead of keeping the joint bent, and the arm ſuſpended, after the reduction, as in the other ſpecies, we muſt keep it ſtraight by means of a ſplint applied on the fore arm for a conſiderable way on each ſide of the joint, which will keep

keep the fractured bones in their places, without inconvenience to the patient.

In young ſubjects the bandage ought to be unlooſed in ten or twelve days, gently bending the joint, but not in ſuch a manner as to hurt the fracture; and this ſhould be carefully done for ſeveral minutes twice a-day, until the oſſification is complete. In people of more advanced age, the arm ſhould not be unlooſed before the ſixteenth day, after which the joint ſhould be bent frequently. Where this is not attended to, the muſcles are often ſo contracted, that they prevent the full extenſion of the arm; and in ſome caſes the patient does not fully recover the uſe of it in many months, or even for life.

When the joint has been much injured, but without any fracture of the bone, the arm may be ſuſpended by the leather inſtrument repreſented Pl. 1. Fig. 5. If any pain or ſwelling ſhould remain after the reduction is performed, we muſt remove them in the manner already directed.

Some inſtances have occurred where the radius was ſeparated from the ulna and humerus, without any other injury to the joint; though this ſeparation of the bones of the fore arm happens more frequently at the wriſt than the elbow. In this caſe the rotatory motion performed by the radius upon the ulna is entirely deſtroyed,

ſtroyed, and the pronation and ſupination of the hand cannot be performed. This affection may be in a great meaſure removed by the application of a tight flannel roller, immediately below the joint, to keep the bones together, and the arm ought to be ſuſpended as directed.

In ſevere falls we ſometimes find, that, where the wriſt was ſuppoſed to have been diſlocated, there is not any diſplacement of the ſmall bones, but that the ulna is farther ſeparated from the radius than it ought to be; in which caſe, as well as the former, the motions of pronation and ſupination cannot be performed. In ſome inſtances the bones are ſeparated from one another to a very conſiderable diſtance, the pain is extremely violent, and attended with great ſwelling, heat, and tenſion. The firſt thing, therefore, to be done, is to alleviate the pain and other inflammatory ſymptoms, by the application of a great number of leeches, promoting the diſcharge by laying the fore arm and hand in milk-warm water; and after it has ſtopped, to roll up the arm in cloths moiſtened with ſolution of ſugar of lead. The pain and ſwelling being thus in a great meaſure removed, the two bones muſt be brought together by a flannel roller applied from the hand upwards, but not ſo tight as to interrupt the circulation, though ſufficient to keep

the bones together. To prevent them from being again displaced, the fore arm ought to be suspended as formerly directed, for a considerable time, until the parts have recovered their strength.

## SECTION VIII.

### *LUXATIONS OF THE BONES OF THE WRIST.*

From the small size of these bones, as well as from their number, luxation of the wrist would very frequently happen, had not nature strongly secured the joint, not only by very firm ligaments, but by the manner in which they are placed, viz. forming an arch with the convex side outwards, or towards the upper part, from whence injuries are most likely to be received. Sometimes, however, from severe falls, when the joint is quite relaxed, one or more of the bones may be forced from their place, generally to the outside, which is the direction they for the most part, or indeed always take from their peculiar shape, and the arch formed by them. At other times, one or more of the three bones which articulate with the radius and ulna, viz. the scaphoid,

ſemilunar, and cuneiform bones, are ſeparated from the bones of the form arm, as well as the other ſmall bones that compoſe the joint. The ſmall bones alſo which ſupport the metacarpus are ſometimes ſeparated from the metacarpal bones, as well as from one another. The injury is very eaſily diſcovered, as the bones are covered only with the ſkin, and ſome ligamentous-like ſubſtance. It is commonly attended with great pain, ſwelling, and tenſion; and always with a total loſs of motion in the joint. Sometimes only one of the bones is removed a very little way from its place; but, even if the injury is in the ſmalleſt degree that we can ſuppoſe to happen, it is always eaſily diſcovered when recent; for the ſmalleſt derangement of a ſingle bone is productive of moſt acute pain, and loſs of motion in the joint; which muſt for ever remain, unleſs the luxation is reduced. When this is done, the patient muſt be conveniently ſeated in a chair oppoſite to a ſtrong light. An aſſiſtant ought to take hold of the arm immediately above the joint, while another lays hold of the hand, and ſupports it firmly, but muſt ſtretch the joint. In this ſituation the ſurgeon ſhould carefully examine the parts, and having fully aſcertained the extent of the injury, he muſt introduce the point of the bone into its proper place, and preſſing it in, as it were, with his

two

two thumbs; whilſt, with all the force his fingers can exert, he ſeparates the other bones of the wriſt from each other, to make room for the diſplaced one. But, as ſoon as he perceives that the bone is fairly entered into its place, the exertion with his fingers muſt then gradually ceaſe; nay, it muſt be in ſome meaſure reverſed, ſo that the under point may be eaſily puſhed into its proper place. We may know that this is the caſe from the abatement of the pain, and the equal feel of the joint, which will always take place after the bones are properly reduced. It will be neceſſary to retain the bones in their place, by means of a ſplint properly covered with cloth, retained by circular bandages.

In luxations of the wriſt we frequently meet with very high degrees of inflammation, which can only be removed by copious blood-letting with leeches frequently repeated. If, however, all the bones of the wriſt, which, from their connection with one another, form a kind of ball, ſhould be forced outwards, as it were, on the external ſurface of the bones of the fore arm, the limb will then be ſhortened, and the wriſt diſtorted and deformed by two tumors; the one external, formed by the bones of the wriſt; the other internal, and formed by thoſe of the fore arm. In ſome caſes the ends of the bones of the fore arm are forced through the integuments, forming

forming a compound luxation. This is always attended with great pain; and, if not ſpeedily reduced, with very violent, or even fatal conſequences. The mode of reduction, however, is ſufficiently obvious. The fore arm is to be held firmly by an aſſiſtant, while the extenſion is made by another, laying hold of the hand, and gradually extending the wriſt, but with ſuch force, that the ſurgeon can move the diſlocated ball into its proper place, which may eaſily be done by his hands, there being nothing to interrupt the reduction, or to force back the ball when once replaced. After the reduction is completed, the arm and hand ſhould be placed on a ſplint, kept quite free from motion, by tying up the arm with a roller. But, in a compound luxation, the air muſt be as effectually prevented as in a caſe of compound fracture, and treated exactly in the ſame manner.

## SECTION IX.

### *LUXATIONS OF THE BONES OF THE METACARPUS AND FINGERS.*

The metacarpal bones may ſometimes be diſlocated from their connection with the bones of the wriſt, though this happens much more ſeldom

dom than might be expected, probably by reason of the mobility of the hand, which does not resist any force externally applied to it. When they happen to be displaced, however, the method of reduction is the same as that just recommended in dislocations of the wrist from the bones of the fore arm. The fingers and thumb sometimes are dislocated in all their different phalanges; and the injury is easily discovered by the pain, deformity, &c. which always take place. For the reduction, an assistant is to lay hold of the hand, fixing it firmly, while the surgeon pulls down the finger with all his force. From the prominence at the end of the bone, however, it is evident that the extension must not be in a straight line, but in such a way that the ends of the bones may make an obtuse angle, raising them from one another as much as possible during the extension. Thus must all the different phalanges of the fingers be reduced; for, if pulled in a straight line, scarcely any force that we can apply will be sufficient to reduce them.

SECT.

## SECTION X.

### *LUXATION OF THE THIGH-BONE AT THE HIP-JOINT.*

THIS joint, in its natural ſtate, is admirably calculated to give that degree of ſtrength which is neceſſary to ſupport the body, as well as the freedom of motion which it is proper the lower extremities ſhould have. The acetabulum for the reception of the head of the thigh-bone, formed by the oſſa innominata, is very deep. The head of the thigh-bone is kept in the joint, not only by the capſular ligament, though much ſtronger here than in any of the other joints, but by a ſtrong round ligament of great ſtrength riſing from the centre of the ball, and fixed to the center and bottom of the ſocket, while, at the ſame time, the whole joint is covered with ſtrong, thick, and ſhort muſcles. Hence, it is plain that this joint cannot be diſlocated without extreme violence, and great laceration; not only the capſular ligament, but that ſtrong one which runs between the head of the thigh-bone, and bottom of the ſocket, being neceſſarily broken before the bone can ſlip out of the acetabulum.

tabulum. Hence, it has been the opinion of many ſurgeons that a true luxation of the hip-joint can never take place, and that the caſes which have been recorded under that definition were, in reality, fractures of the neck of the os femoris, which have already been treated of. It is certain, however, not only that this joint may be luxated, but that ſometimes it may be done by what we might reckon only a ſlight injury. This may happen when the thigh-bone acts as a lever on the upper ſide of the acetabulum, or ſome obſtacle near it, and when the force is applied near the neck of the bone, whilſt the knee is fixed. Fractures of the neck of the thigh-bone may be eaſily diſtinguiſhed from the diſlocations we treat of, becauſe in the former there is always a very conſiderable grating when the head of the bone is rolled; but, in caſes of diſlocation, there is no ſuch thing, the injured limb is longer than the other, and the knee and foot turned out. In caſes of this kind, the head of the bone is always turned out below the acetabulum in the foramen ovale, or lower part of the groin. It has indeed been ſaid by authors, that the thigh-bone may be diſlocated in ſeveral different ways, viz. upward and backward, downward and backward, upward and forward, and downward and forward. All theſe, or any other variety of luxation, if any ſuch ſhould exiſt, may eaſily be diſcovered by the

the ſymptoms which take place. When the bone is diſlocated upwards, the leg muſt neceſſarily be ſhortened, and the foot turned inwards; while, at the ſame time, a cavity is felt near the groin, the ball being on the dorſum of the os innominatum. When the head is forced downwards, the limb is elongated, and a cavity felt on that part of the haunch-bone where the joint uſed formerly to be. At any rate, however, it will moſt commonly be found that the diſlocated head is forced downwards into the foramen ovale. As ſoon then as we have ſatisfied ourſelves of the nature of the diſeaſe and its ſeat, we muſt attempt to reduce the bone to its former place; and the ſtrength requiſite for this purpoſe muſt undoubtedly be proportioned to that of the muſcles which are oppoſite it, the length of time the luxation has continued, and the adheſions that have taken place in conſequence of the joint not being reduced.

A number of contrivances have been fallen upon to reduce the luxated thigh-bone, which would prove tedious to relate, and I think the detail at preſent unneceſſary, it being ſufficient to deſcribe the following ſimple method, which muſt at all times anſwer the purpoſe. Let the patient be laid upon a table of ſufficient height on his ſide, with the injured limb uppermoſt, the table being previouſly covered with a matreſs and

and blanket. A ſtrong wooden roller, covered with ſeveral folds of flannel, is to be put between the patient's thighs, along with a down or fine feather pillow. Having ſtrongly fixed an iron ring in a pillar in a wooden wall, we muſt paſs a ſtrap through it, the end of which muſt be firmly faſtened to one end of the roller before, while the other end of the ſtrap is to be faſtened to the hindermoſt end of the roller. The knots muſt be very firm; and, on the under end of the thigh, the ſame kind of taches are to be faſtened, as deſcribed in treating of diſlocations of the humerus. Two double ſtrong cords muſt be put through theſe taches after they are formed, viz. one on the outſide, and the other on the inſide of the thigh; and a ſufficient number of ſtrong men muſt take hold of theſe cords to make the extenſion, the trunk of the body and pelvis being rendered immoveable with reſpect to the extending power. The extenſion muſt be gentle at firſt, and gradually increaſed as much as is neceſſary; the ſurgeon, in the mean time, firmly holding the knee-joint with one hand, and the foot with the other, the former joint being conſiderably bent to relax the muſcles as much as poſſible. All the time that the extenſion is making the leg and thigh muſt be rolled, in order to detach the bone from any adheſions it may have formed while in a diſlo-

cated ſtate. The extenſion having been continued for a conſiderable time, and increaſed to a great degree, two aſſiſtants muſt take hold of each end of the roller to elevate the end of the bone from the foramen ovale in which it is lodged. This being done, the extending force muſt inſtantly be ſlackened, while the ſurgeon moves the thigh forcibly inward, and puſhing the head of the bone ſomewhat upward, and obliquely outward. If the extenſion has been ſufficiently ſtrong, and the head of the bone properly elevated, it is impoſſible to fail in reducing the luxation; indeed, in moſt caſes, it is unneceſſary to move the roller at all on account of its ſize, which, when well covered with cloth, muſt be conſiderable, beſides the thickneſs of the pillow which is joined with it. The head of the bone will indeed be elevated by the roller itſelf, provided you make the aſſiſtants, as they continue their extenſion, depreſs the knee by lowering their hands and bodies. Thus, the head of the bone, as ſoon as completely freed by the extenſion, will inſtantly be forced back into the ſocket by the contraction of the muſcles, with ſuch a conſiderable jerk and noiſe as to be heard by all the bye-ſtanders. If it ſhould happen that the bone does not return to its place as was expected, recourſe muſt be had to new extenſion, which muſt be made ſtronger than before,

before, it being only in this way that we can ſucceed. When the head of the bone is driven outwards and upwards, it generally requires but little trouble to pull it downwards into the ſocket.

In this way, it is evident, that, from the immoveable manner in which the body is fixed, that the extending force applied to the limb may be augmented to any degree you pleaſe, and thus all unneceſſary or pernicious machines are laid aſide. In my private practice I have reduced many in this way; and, when tried in the hoſpital, I have never known it fail. The late Dr Aitken, I believe, was the firſt who attempted a fixed point in extenſions of this kind. It muſt be owned, however, that, in ſome caſes of very long ſtanding, a change may have taken place in the ſocket, after the bone is brought in contact with the acetabulum, yet the ſtroke of it upon it on the ſocket is very weak, or even imperceptible; but, in theſe, as well as in other caſes, we may be certain of having accompliſhed our purpoſe when the limb is of a proper length, and the knee and foot in their proper ſituations, and retaining them after the extenſion has ceaſed.

In this, as well as in other caſes of luxation, if any conſiderable degree of inflammation takes place, we muſt remove it by the methods already

ready laid down; and the patient ought to be hindered from uſing his limb too ſoon, leſt the parts ſhould not have recovered their tone ſufficiently. From a caſe recorded in the Medical Obſervations, however, it would appear, that, in luxations of this joint, the muſcles recover themſelves more ſpeedily than in other parts of the body. The patient was a robuſt healthy man of thirty-four years of age, who had got the hurt by a waggon, loaded with corn, falling upon him. When the ſurgeon was called, he found him complaining of a violent pain in his right groin; and, on examining the part, a round hard tumor was felt juſt above the foramen ovale, which he knew to be occaſioned by the head of the bone lodged there; there was likewiſe a numbneſs of the thigh, from the compreſſion of the cruval nerve, and the knee and foot were turned outwards. The reduction was performed by laying him acroſs a bed on his back, with his left heel againſt the frame of the bed-ſtead, to ſerve as a ſupport againſt the ſtrong extenſion neceſſary on the occaſion; and this counteracting power was further increaſed by another man lying in bed with him, and holding him down with all his force. On proper extenſion being made, the bone ruſhed into its place with a conſiderable ſnap heard by all preſent; and he inſtantly found himſelf

himſelf ſo well, that it was with difficulty he could be prevailed upon to remain in bed; neither did the leaſt pain, ſwelling, or inflammation ever take place afterwards.

## SECTION XI.

### *LUXATIONS OF THE PATELLA.*

This bone may be either completely or partially luxated; and in both caſes, even where the injury is ſlighteſt, the patient ſuffers great pain, lameneſs, and inability, to move the joint. The bone cannot be luxated upwards or downwards without a rupture of the tendons, though it may from ſide to ſide; and, by reaſon of the ſmaller ſize of the inner condyle of the os femoris, it is generally forced to the inſide, though, in two caſes that I ſaw, it was completely thrown to the outſide. Luxations of the patella are very eaſily diſcovered, by reaſon of the thinneſs of the integuments; however, if the ſurgeon is long of being called, ſuch a degree of ſwelling may take place, as may render the caſe ſomewhat doubtful; a little care, however, will always enable him to diſtinguiſh a cavity in the place where the

the patella ought to have been, the bone itſelf being, as already ſaid, generally on the inſide of the joint. For the reduction, we muſt lay the patient on a table, in a bed, or on the floor; the limb being ſtretched out by an aſſiſtant, and kept ſo, while the ſurgeon takes hold of the patella, raiſes it a little, and, at the ſame time, puſhes it forward, depreſſing the external edge, whilſt he elevates the one next the joint. Thus it will be very eaſily replaced; after which, the patient muſt keep his bed for a day or two, till the tendon has in ſome meaſure recovered its tone.

## SECTION XII.

### *LUXATIONS OF THE KNEE.*

By this kind of luxation, we mean the removal of the upper ends of the tibia and fibula from the lower end of the os femoris. The ſurfaces of the joint are larger than any other in the body; and hence the motion of it is leſs extenſive than that of the elbow, which is of the ſame kind. On this account luxations of the knee are rarely met with; the joint being very much ſtrengthened, not only by the largeneſs of its ſurface

ſurface juſt mentioned, but by the croſs ligaments which are within its cavity, the ſemilunar cartilages, the broad and ſtrong tendon that nearly inveſts it, and laſtly by the muſcles and tendons that paſs over, or are inſerted near it. As a luxation, therefore, cannot take place without extreme violence applied externally, and, as it muſt always be attended with great laceration and diſtraction of the ligaments and tendons, we can never be at a loſs to diſcover it; eſpecially as it is always attended with the moſt violent pain, total lameneſs and deformity of the limb. When the luxation is to be reduced, we muſt place the patient on a table or acroſs the bed, cauſing one or two aſſiſtants fix the thigh firmly, while the ſurgeon extends the limb, and replaces the bones. After the joint is fully reduced, the patient muſt be put to bed, and the inflammatory ſymptoms relaxed by the remedies proper for that purpoſe; and in this reſpect the ſurgeon muſt be very aſſiduous; for, in no caſe whatever is the inflammation apt to riſe to a greater height. Local blood-letting, therefore, with other antiphlogiſtic remedies, muſt be largely uſed, the limb being kept perfectly at reſt, and every method taken to keep the patient undiſturbed, till the cure is accompliſhed.

SECT.

## SECTION XIII.

### *LUXATIONS OF THE ANCLE JOINT.*

THOUGH this joint is formed on the ſame plan with that of the knee or elbow, yet, having a conſiderable ſhare of lateral motion, and being in itſelf much weaker, it is more frequently luxated. The upper part of the aſtragalus, which is not perfectly round, is received into a correſponding cavity in the lower end of the tibia, guarded on the inſide by a ſtrong proceſs of the tibia, called the internal ancle, and on the outſide by the end of the fibula, which projects conſiderably beyond the tibia, and is called the external ancle; whence it is evident that a luxation of this bone, either inwardly or outwardly, can ſcarce ever take place without a fracture of the fibula. Hence, ſimple luxations of the joint are extremely rare, though not very uncommon, when the fibula alſo is broken. I have ſeen, however, two caſes of luxation of the ancle, in which the end of the tibia was forced inwards, through the integuments, the foot being thrown outwards. In both, the integuments were ſo much torn, that the joint was expoſed to view,

and the air had acceſs into its cavity; and both proved fatal. One of the patients was a gentlemen of very groſs habit of body, and the joint had been long expoſed to the air in a very cold winter night. The parts were firſt carefully cleanſed from every extraneous body, and warm fomentations were afterwards applied to the wound. The bones were eaſily and completely reduced; but from the very great injury which had been received, as well as from the appearance of the conſtitution of the patient himſelf, I was induced to make an unfavourable prognoſis, and therefore adviſed the immediate amputation of the limb. In this, however, I was oppoſed by the ſurgeons who were along with me, and who made uſe of this moſt abſurd and pernicious argument, "that it was yet *too ſoon* to think of ſuch a remedy." I eaſily foreſaw, that, by the delay, ſuch a degree of pain, inflammation, and ſwelling, would enſue, as muſt render the amputation of no uſe whatever. The event ſhowed that my opinion was too well founded. In twenty-four hours the limb ſwelled to a great ſize, the edges of the wound became livid, and all the neighbouring parts aſſumed ſuch an appearance as indicated an approaching mortification; the whole limb being of a yellowiſh colour, and the ſwelling reaching as high as the knee. Several other gentlemen were now called in, but it was evidently impoſſible to do any

thing for the relief of the unhappy patient, who accordingly died in forty-eight hours after the accident, of an ESTHIOMENE, or univerſal mortification. The ſecond caſe was that of a young woman, whoſe ancle was diſlocated with nearly the ſame circumſtances as thoſe of the preceding. The integuments were conſiderably lacerated, and part of the body of the joint expoſed, but the end of the tibia did not wholly project, nor was the foot thrown completely to the outſide. The accident happened in the month of July 1780, when the thermometer ſtood at upwards of 70°. The bones were eaſily reduced, and the utmoſt care taken, during the time of dreſſing, to exclude the atmoſphere from the joint; but, in twenty-four hours the patient was attacked with ſevere pain in the fauces and about the top of the glottis, with violent ſpaſmodic ſymptoms. They came on chiefly when ſhe attempted to ſwallow, and, at firſt, continued only a few minutes; but, in ſix hours after the firſt appearance of theſe ſymptoms, they had increaſed to ſuch a degree, that, during the ſpaſmodic affections of the throat, her lower jaw was fixed ſo ſtrongly that it could not be opened, and was thus retained for nearly half a minute; though the wound did not appear inflamed, nor had ſhe conſiderable pain in the injured limb. Large doſes of opium, muſk, æther, and every other antiſ-

antiſpaſmodic that could be thought of were exhibited, but to no purpoſe. Amputation was at laſt propoſed; but, before that could be performed, the patient died, on the third day after the accident.

In luxations of the ancle, the tibia is for the moſt part puſhed forward, by which the foot is ſhortened, and the heel lengthened, or when the tibia is forced backwards, and the aſtragalus forward, by which the foot is lengthened, and the heel ſhortened. It may, however, be luxated either outwardly or inwardly; and in this caſe there is always a remarkable cavity on the one ſide, and a prominence on the other. When a luxation is to be reduced, the patient may either be placed on a bed or the ground; having his limb firmly ſecured by an aſſiſtant or two, while the foot is to be extended by the ſurgeon, in ſuch a direction as will keep the muſcles in the greateſt ſtate of relaxation. The extenſion muſt be continued, gradually increaſing it all the time, until the tibia has regained its ſituation; which it will inſtantly do when freed from the aſtragalus; or, if it ſhould not return with all the force that is neceſſary, we muſt force it into its place with our hands.

Partial luxations of the ancle muſt be treated as already directed; and when the fibula happens to be fractured along with a lateral diſlocation

tion of the ancle, it will be neceſſary to lay the limb upon a pillow, with a firm ſplint below it, the inflammatory ſymptoms being allayed by the methods already mentioned.

## SECTION XIV.

### *LUXATIONS OF THE BONES OF THE FOOT.*

THE os calcis is connected in ſuch a manner with the tendo achillis, that it cannot be luxated either backwards or forwards; though ſometimes it is found outwards, but never inwards. This is attended with moſt acute pain, total loſs of motion in the foot, with a ſwelling on the outſide, and proportionable cavity on the inſide. In this caſe, the limb muſt be firmly fixed by an aſſiſtant, while the ſurgeon endeavours to relax the tendons as much as he can; after which he muſt forcibly puſh the bone into its place.

The other bones of the foot, viz. the os naviculare, the three cuneiform bones, and os cuboides, form a ſtrong arch, ſo that, in general, when diſlocation takes place in any of theſe, they are forced upward and inward, and no longer have the arch-like appearance they had before. Diſlocations

Fig. 1.

Fig. 2

Fig. 3

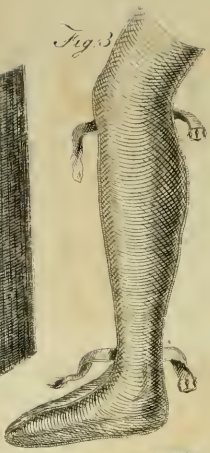


Fig. 4

Fig. 5.

Fig. 6

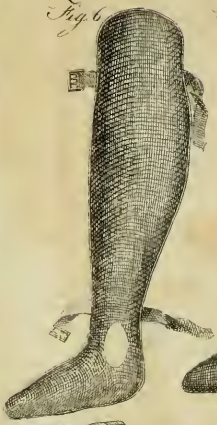


Fig. 7

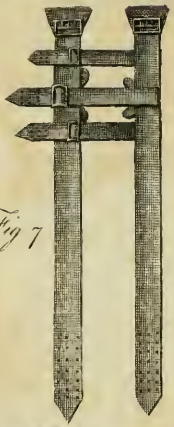


Fig. 8

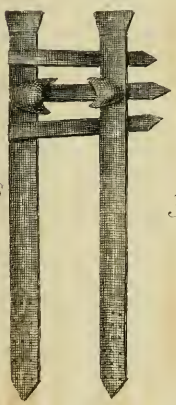
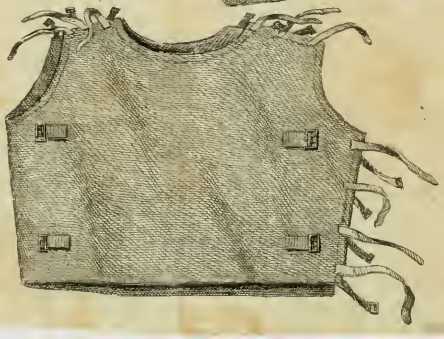


Fig. 9



locations here, as well as in the ancle, are attended with moſt violent pain, loſs of motion, and irregularity on the upper ſurface of the joint by the ſtarting up of the bone. When any of the three cuneiform bones are forced from their place, the firſt will commonly be driven upwards and inwards; the other two upwards and outwards. To reduce the firſt, we muſt bend the toes and heel pretty forcibly outwards, puſhing the bone afterwards into its place by preſſing it downwards and inwards; and as ſoon as this is done, the ſymptoms will ſubſide almoſt entirely. To reduce the others, which will be difficultly felt on the top of the foot, we muſt force the ſides of it oppoſite to that on which the bone is, the one outwards and the other inwards; after which the bone is to be placed directly over the opening, and then forced into its place, by puſhing it downwards. Thus alſo are the os naviculare and cuboides to be replaced. They muſt be retained in their places in the manner directed in luxations of the wriſt; and the inflammatory ſymptoms removed as in other caſes. In luxations of the bones of the toes, the ſame method is to be followed as in thoſe of the fingers.

CHAP.

## CHAP. VI.

## *OF AMPUTATION.*

THIS operation conſiſts in the removal of a limb which, having become ſo much diſeaſed as to be entirely uſeleſs, is to be cut off as an incumbrance, or, what is worſe, as an infectious maſs, in danger of communicating a mortal diſeaſe to the whole body. From the very great loſs, however, which the patient muſt ſuſtain by the loſs of his limb, as well as the dangerous nature of the operation itſelf, there is no ſurgeon, of either humanity or ſkill in his profeſſion, that will ever propoſe to amputate without the moſt decided and evident neceſſity for ſo doing. We are told, indeed, that this operation is not difficult to thoſe who can handle the inſtruments; but certain it is, that in no operation in ſurgery is the dexterity of a ſurgeon more neceſſary or more conſpicuous. From every day's experience, we ſee that patients may ſuffer in conſequence of amputation, from hæmorragy, or from tetanic affections, by tying up the nerves along with the blood-veſſels. Beſides

ſides this alſo, it requires no ſmall degree of ſurgical and even medical knowledge, not only to diſtinguiſh thoſe caſes in which the amputation is abſolutely neceſſary, and when it may be ſpared, but alſo, when it is undeniably neceſſary to point out the proper time at which it is to be performed, all which I ſhall now conſider in their proper order.

## SECTION I.

### *OF THE CAUSES WHICH RENDER AMPUTATION NECESSARY.*

THESE may all be comprehended under the following heads: 1. Bad compound fractures. 2. Extenſive, lacerated, and contuſed wounds. 3. When part of a limb is carried away by a cannon-ball, or when it is wholly ſo, if the parts are much lacerated it will be neceſſary to amputate higher up, if poſſible. 4. When the parts of a joint are deſtroyed by a white ſwelling. 5. Where the motion of the limb is deſtroyed by large excoſtoſes, and the life of the patient thus endangered. 6. Extenſive mortifications. 7. Ulcers, attended with extenſive caries. 8. Cancers

cers and other corrosive and incurable ulcers. 9. Tumors of various kinds. 10. Particular kinds of distortions of the limbs.

1. *Bad compound fractures.* I have formerly remarked, that, in cases of this kind, if the bones and soft parts are so much injured that we can have no reasonable hope of recovering the use of the limb, it ought instantly to be amputated. The operation is particularly required where the bones are so much shattered that they cannot be reduced, and the muscles and large blood-vessels separated from the bone for a considerable way, the integuments also being very much torn; all which may happen from the discharge of fire arms, as by cannot-shot, the explosions of shells, &c. or the like may happen from violent bruises. But, when there remains any hope of reducing the bones to their pristine situation, we ought by no means to propose to amputate, especially where the integuments are not much torn, and the blood-vessels and muscles are not separated for any considerable space from the bone. We must, however, consider that there is a very great difference, in this respect, according to the treatment we are able to give the patient. In private practice, where we can treat him properly, allow him to remain at rest, and secure him from the inclemency of the weather, very bad compound fractures may be healed

without much difficulty; but, where he is toſſed about from place to place, expoſed to hardſhips, and every moment in danger of having the bones diſplaced by the jolting of ill conſtructed carriages, the moſt favourable caſes of this kind will prove dangerous, and very often incurable. Though it be difficult, therefore, to lay down any rule which will hold good in all caſes, yet we may always venture to aſſert, that where the knee or ankle joints are deſtroyed, where the elbow and wriſt joints are in the ſame ſituation, and where the teguments and blood-veſſels connected with them are alſo deſtroyed, we ought not to heſitate a moment about amputation. But, if the operation is not immediately performed, we muſt not attempt it, until the inflammatory ſymptoms, conſequent upon the injury, are in ſome meaſure gone off; and theſe are to be removed by the uſual remedies for inflammation, of which we have ſpoken ſo largely in other parts of this work, that it is ſuperfluous to ſay any thing farther at preſent.

In ſome caſes amputation may be neceſſary, (even after the patient ſeems to be doing well), from an hæmorrhage taking place in one or more of the principal arteries of the limb. Theſe may be occaſioned by the ſharp ends of the fractured bones wounding the blood-veſſels, or a neceſſity of amputation may take place,

even in the hands of the moſt ſkilful practitioner, when the ends of the bones remain diſunited, after every method has been taken to remove all ſplinters which might irritate the parts, and produce an extraordinary diſcharge of matter. When the bones remain thus diſunited, the diſcharge, inſtead of being diminiſhed, continually increaſes, and waſtes the ſtrength of the patient, in ſpite of every effort, either by diet or medicine, to ſtop or diminiſh it; and, in ſuch caſes, the life of the patient can only be ſaved by amputation.

2. *Lacerated and contuſed wounds.* Here amputation becomes neceſſary when the ſkin, muſcles, and blood-veſſels, are ſo much torn and bruiſed, that no hope remains of the circulation being ever carried on through them any more. Caſes of this kind do ſometimes occur without any fracture taking place. Some years ago, as ſome labourers were removing a large quantity of earth, having unadviſedly dug too far in below the ſurface, it gave way, and five of them were grievouſly hurt. One, in particular, had the greateſt part of the ſkin and muſcles torn off from his left thigh and leg, from the haunch downward; and the large blood-veſſels were in the ſame ſituation, the bones being in many places left quite bare, and the origins and inſertions of the muſcles into them being plainly ſeen.

ſeen. I happened to be paſſing by at the time this remarkable diſaſter happened, but could give him no aſſiſtance; though, had the accident happened only to the leg below the knee, there is no doubt that the patient's life might have been ſaved. The poor man was carried home, and died in a few hours.

In wounds of this kind, we may alſo be obliged to have recourſe to amputation, from the violent inflammation and vaſt diſcharge of matter which takes place in conſequence of it. From the loſs of ſubſtance alſo, large portions of the bone are frequently expoſed; and matter being formed in deep cavities, where it becomes extremely acrid by confinement, is abſorbed into the blood, and deſtroys the patient's health. Here, it is evident, that the only chance the patient can have for his life, is by the amputation of the limb.

3. *Where the limb or part of it is carried away.* Here it is commonly neceſſary to amputate higher up, as thus the wound may be healed almoſt by the firſt intention, while, if no amputation were performed, the cure muſt prove inſufferably tedious, or perhaps not go on at all, by reaſon of the ſplintered bones, or ſhot left in ſome of the remaining parts, as well as the violent contuſion and laceration of the ſoft parts. Where amputation is performed in ſuch caſes, on young and healthy ſubjects, who are general-

ly

ly ſubjected to ſuch accidents, the cure will be performed in the third or fourth part of the time that would be required, if it were left to nature, even though aſſiſted by every effort of art. Nay, when the ſurgeon has uſed his utmoſt endeavours to cure ſuch wounds without any further amputation, it very often happens that ſuch ſinuſes are formed amongſt the muſcles, and ſuch a diſcharge of matter takes place as would deſtroy the patient, if amputation were not performed at laſt. Here, it muſt be evident, that a great deal of trouble and danger to the patient would have been avoided, had the operation been performed immediately after the injury was received; and, what is worſe, when the ſurgeon has acted in this erroneous manner, the patient very often will not ſubmit to have his limb amputated in time to ſave his life; but, by perſevering ſtill longer in this hopeleſs courſe, will at laſt render the operation totally uſeleſs.

4. *Mortification.* It has, in former parts of this work, been ſhown in what manner mortification may take place from very high degrees of inflammation, and likewiſe how it may be prevented or ſtopped after it has once begun. Here I ſhall only remark, that, as ſoon as a gangrene has certainly taken place, we muſt endeavour, by every means in our power, to keep up the ſtrength of the patient until the mortifica-

tion

tion ſtops, after which we are to think of amputation. The firſt ſign of an approaching ſeparation of the mortified parts, is the appearance of a red inflamed circle between them, and ſuch as are ſound. In a day or two, this inflamed ring ſeparates itſelf from the reſt, by a diſcharge of well digeſted pus, the pulſe of the patient riſes, and his health begins to mend. The mortified parts would now ſoon be ſeparated of their own accord, and the ſore heal as a common purulent ulcer, where the mortification is not of any great extent; but, in caſes of ſuch extenſive mortification as thoſe produced by compound fractures, &c., the patient would probably be deſtroyed by the exceſſive diſcharge, were the cure left to nature, and therefore amputation ought always to take place as ſoon after the ſeparation of the mortified parts takes place as poſſible. It ſeems moſt natural, however, to take off the limb as ſoon as we perceive it to have received ſuch an injury as would certainly bring on a mortification. This, indeed, has been diſputed, and the arguments, on both ſides, enumerated under the head of compound fractures. The only argument of any weight, in favour of delay, is, that the operation itſelf is a violent injury to the human frame, and may even bring on death. The injury which the limb itſelf has ſuſtained is of the ſame kind;

ſo

ſo that, amputating juſt after the firſt injury has been received, is ſuperadding a ſecond, before the ſyſtem can have time to recover the ſhock of the firſt. Without entering farther into this diſpute at preſent, however, I ſhall only obſerve, that, if we delay until the mortified parts begin to ſeparate, the operation ought then to be performed as quickly as poſſible, that the patient may not ſuffer from the abſorption of the putreſcent matter.

5. *White Swelling.* In the firſt volume of this work, we have ſo fully treated of thoſe diſorders, that nothing farther is neceſſary to be ſaid here; for which reaſon, I ſhall only refer the reader to that volume.

6. *Exoſtoſes.* Amputation becomes neceſſary here, when the exoſtoſis is of ſuch a ſize as to affect not only the bones, but to reduce alſo the ſoft parts, into a kind of grumous matter, the whole being of a puffy nature, and mixed in various parts with pus, being alſo apparently ready to burſt in theſe places. I met with a caſe of this kind, where the diſeaſe began originally at the top of the right tibia, immediately below the knee, the ſwelling being only about the ſize of an hazel nut. This ſwelling took place in the time of childhood, and gradually increaſing afterwards, arrived at laſt at ſuch a ſize, that, when I ſaw him, the knee joint meaſured no leſs than

than thirty inches in circumference, the colour being livid, particularly about the head of the fibula. There were ſeveral irregular ſoft bodies projecting from it, and the whole leg was much ſwelled; nor could any bone be felt in it until you came to the ancle. Here it was ædematous; which, in ſome meaſure, kept the bones from being eaſily felt. The ſwelling had increaſed very rapidly during the laſt twelvemonth, in which time it had nearly tribled its former ſize; and, for ſix months, had been ſo painful, that the poor patient could not move it in the leaſt, but by lifting the whole limb. He was at this time only fifteen years of age, and the whole complaint had originated from a blow on the tibia. In ſuch a caſe, it is evident that nothing but amputation had any chance of doing good. I have met with four exactly ſimilar, and it is only in ſuch that I would at all adviſe amputation.

7. *Ulcers attended with carious bones.* Theſe are mentioned by authors as ſufficient reaſons for amputation; but, if ever they are ſo, the caries muſt not only be very extenſive, but of ſuch an inveterate kind as to render the ſucceſs of the operation itſelf doubtful. To amputate at all events, even in caſes of very large caries, would undoubtedly be too raſh. Several caſes of carious bones have come under my inſpection,

tion, in which the whole tibia, from the upper to the under end of it, was carious, the ulcers being every where extenſive, flabby, and of a pale colour, emitting a fœtid ſanies. The bone felt rough and full of holes; yet has this violent diſeaſe been cured without any amputation, and the bone completely exfoliated, and a new one been produced. In ſuch caſes, where the patient is under twenty-four years of age, and his health little impaired, we will commonly ſucceed, by uſing proper remedies, ſuch as have been directed in a former part of the work; but, if after all our endeavours, the bone does not exfoliate, or, after it has come away, the ulcer does not heal, and the patient's ſtrength begins to ſink, the only chance we then have to ſave his life, is by an amputation.

8. *Cancers, and other incurable ulcers.* Cancers have been treated of in the firſt volume of this work, and amputation recommended as the only method by which they can be prevented from deſtroying the patient; and, with regard to others, we may refer to what has been juſt now ſaid upon caries.

9. *Various kinds of tumors.* Among theſe we may reckon the exoſtoſes already mentioned; but the principal are thoſe of the aneuriſmal kind. Theſe may take place in fractures, where the ends of the bones ſlip beyond each other,

and wound the coats of an artery; or, it may happen, after the operation for an aneurifm has been performed, that the circulation of the blood cannot be renewed, and the limb is in danger of a mortification. In fpurious aneurifms, alfo, where the mufcles and blood-veffels are totally diffolved, and where the patient would certainly expire from the burfting of the fac, there is not the leaft doubt that the operation ought inftantly to be performed.

10. *Certain diftortions of the limbs.* I have already given an inftance where amputation was rendered neceffary by the obftinacy of the perfon himfelf, who, refufing to move his knee or ankle after a fracture of the tendo achillis, brought on fuch a contraction, as rendered the whole leg an ufelefs burthen. Cafes of this kind, or where the limbs are naturally not only ufelefs but burthenfome, are thofe only in which amputation can be recommended for diftorted limbs.

Thefe are the cafes which only can juftify a furgeon in taking off a patient's limb. We fee they are very different from each other, and therefore require every exertion of attention and fkill on his part, to examine the circumftances and nature of every cafe which comes before him, that he may neither lofe a limb when it could have been faved, nor deftroy the patient's

life by a fruitleſs attempt to ſave his limb. At any rate, when any caſe appears to himſelf dangerous or doubtful, he ought certainly to conſult with ſome of his brethren, that he may not incur the cenſure of raſhneſs or ſelf-ſufficiency; though I muſt own, that, in ſuch conſultations, unanimity ſeldom is met with, and the preconceived opinion of ſome individual generally prevails.

## SECTION. II.

### *OF THE METHOD OF PERFORMING AMPUTATION.*

As this operation is one of the moſt important, as well as the moſt common in ſurgery, the attention of practitioners have been drawn towards it more than any other; and hence we may juſtly conclude that it is in a ſtate as much improved, or perhaps more ſo, than any one of them. In former times, when the tourniquet was unknown, and the cruel method of cauterizing the veſſels was practiſed, the operation was unavoidably attended with much danger, and many patients died; and of conſequence amputation was in little repute. It is foreign to my purpoſe to point

Fig. 6

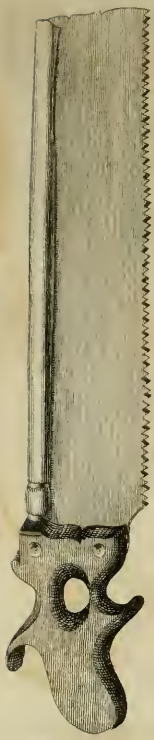


Fig. 3

Fig. 4

Fig. 7

Fig. 8

Fig. 9

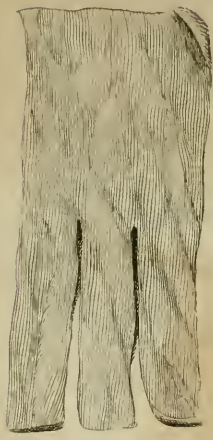


Fig. 11

Fig. 1

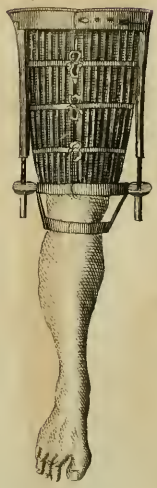


Fig. 12

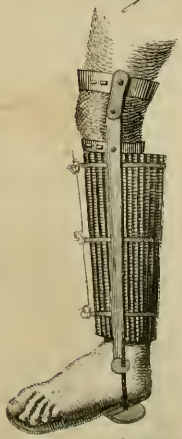


Fig. 5

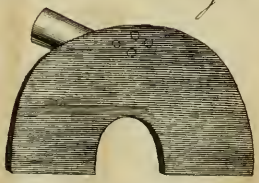


Fig. 10

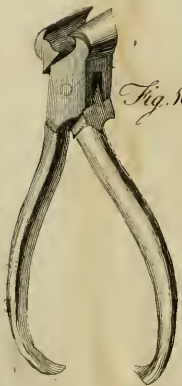
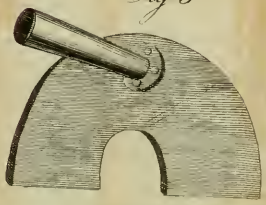


Fig. 15



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point out the gradual improvements that have been made at various times by different practitioners. It is ſufficient to ſay, that, according to the methods now diſcovered, not one in thirty will be in any danger from this operation; even taking in hoſpital as well as general practice. In performing amputation, the following circumſtances ought principally to be conſidered. 1. The ſpot where the inciſion is to be made. 2. The quantity of ſkin and cellular ſubſtance neceſſary to be ſaved, in order to cover the bone and muſcles completely, without being ſtretched. 3. To cut the muſcles in ſuch a manner that they may unite with each other ſo as to cover the end of the bone completely, making allowance for the retraction of the ſkin and ſoft parts which muſt unavoidably take place after the operation. To accompliſh all this, we muſt proceed in the following manner.

Having made the firſt inciſion through the ſkin by means of a ſcalpel, we muſt next ſeparate the ſkin and cellular ſubſtance from the muſcles, for at leaſt two inches all round the limb; and this ſeparated part muſt then be turned up all round the limb, like the head of a ſtocking, leaving the muſcles quite bare. The flap of ſkin and cellular ſubſtance thus turned up is to be kept in that poſition by an aſſiſtant; while the ſurgeon, taking hold of the large amputating knife,

knife, and laying the heel of it in contact with the edge of the turned up cellular ſubſtance, cuts the firſt layer of muſcles all round, ſloping upwards, ſo that the outſide of the divided muſcles may project conſiderably over the inſide, and thus eaſily cover the end of the bone after it is cut. By drawing the knife along in this direction, it will cut almoſt to the very point, and you will generally have the inciſion through the firſt layer of muſcles complete; but, ſhould this not be the caſe, which may ſometimes happen in amputating the thigh, we muſt finiſh the inciſion, by drawing the knife in the ſame direction quite round the limb. As ſoon as this is done, the divided layer of muſcles ſhould be gently retracted by the aſſiſtant; while the ſurgeon, holding the knife, and cutting in the ſame direction as before, divides the remaining muſcles quite to the bone; and after the inciſion is thus fully made, we ought to ſeparate all the ſoft parts from the bone for the ſpace of an inch and a half, or more. This ſeparation is certainly more eaſily and properly accompliſhed by means of a proper ſized ſcalpel than the point of the amputation knife, which is at leaſt a foot long, and conſequently very unmanageable when uſed for the purpoſe juſt mentioned.

By proceeding in this way, firſt cutting and retracting the ſkin and cellular ſubſtance, then cutting,

cutting, in a ſloping direction, the firſt layer of muſcles, and retracting them, and laſtly, cutting and retracting the ſecond layer, it is evident that the bone will be cut a conſiderable way farther up than the place where the firſt inciſion of the ſkin was made. Conſequently, when the ſkin and cellular ſubſtance are again turned down, the muſcles will overlap the bone, and the ſkin and cellular ſubſtance the muſcles. Each part, therefore, will be joined to one of a ſimilar nature with itſelf; muſcles to muſcles, and cellular ſubſtance to cellular ſubſtance; while the bone lying, as it were, in the center of a ſphere, formed by the integuments clapped together, muſt be well covered with a round cuſhion of fleſh, and the ſtump will have a full and ſmooth appearance; the whole being alſo healed more eaſily by the firſt intention, or very nearly ſo.

That the cure may be accompliſhed, however, in the moſt perfect manner, it will be neceſſary to pay great attention to the taking up and ſecuring the arteries in a proper manner. Theſe muſt always be tied up by themſelves, without including the nerves or any of the muſcular fibres; for this, eſpecially the tying up of a nerve, is attended with the moſt dangerous conſequences. It will alſo be abſolutely neceſſary, in order to heal the wound by the firſt intention, that every veſſel of the arterial kind ſhould be tied,

and

and the hæmorrhage entirely ſtopped. For this purpoſe, we are to give the patient ſome warm cordial drink, as mulled port, or warm wine and water, as well as to apply a large, warm, and moiſt ſponge over the whole ſurface of the divided parts, that we may aſſure ourſelves that there is no danger of an hæmorrage from any latent artery, which might afterwards defeat our purpoſe altogether. All the parts muſt now be brought into contact, and ſecured in ſuch a manner as totally to cover the end of the bone; which, if the operation has been performed as directed, they will do to a conſiderable thickneſs.

In this way of performing amputation, we ſee that the object is not merely to ſave ſkin and cellular membrane, for this might be done by retracting them both before and after the inciſion is made, and then dividing the muſcles perpendicularly down to the bone; but, in ſuch a caſe, the muſcles would certainly retract during the cure, and leave a projecting bone covered only by the ſkin, which would thus be liable to continual accidents, and, at any rate, the end of the ſtump would be ſo exceſſively irritable, that the patient would allow nothing to touch it; but, in the way I have recommended, the ſoft and thick cuſhion of fleſh would allow the patient to reſt the weight of his body upon it without any difficulty or uneaſineſs, provided the very top of

it be not touched; for here it will always be tender, and therefore the box of the artificial limb muſt not preſs upon the apex of the ſtump, but muſt ſupport the patient's body by a lateral preſſure upon the muſcles on each ſide of the thigh.

Thus alſo the cure will always be performed by the firſt intention, while little or no matter is formed. If proper care, however, be not taken to keep all their parts in their proper poſition during the cure, matter will very readily be formed; and if the ſame inattention be perſevered in, no doubt very bad effects will enſue. Much depends on a proper excavation of the muſcles, ſo that the bone may be well and thickly covered; and this, even in Allanſon's method, the one I have recommended, is not at all what it ought to be in order to make the ſtump full and plump. Thus I have performed amputation upwards of *fifty* times, without any collection of matter taking place between the parts, and with a perfect ſtump. The cures were performed in fourteen, eighteen, twenty, twenty-four, and twenty-ſix days. In no caſe was the cure ever protracted to a month; all the parts having adhered to each other long before this time; though the ligatures of the arteries might ſometimes keep the paſſages through which they were drawn open for a few days after the reſt were healed.

Having

Having thus deſcribed the general mode of performing amputation, I ſhall next treat of it as it is to be done on different parts of the body.

## SECTION III.

### *AMPUTATION OF THE THIGH.*

In this operation the patient ought to be ſeated on a table, and the diſeaſed limb firmly ſecured by an aſſiſtant, ſeated before him; while another aſſiſtant takes care of the tourniquet, and a third ſecures the patient's hands and other limb. Having ſhaved the hair off the thigh, the tourniquet is to be applied as high as poſſible; while the operator, ſtanding on the outſide of the limb, makes a circular inciſion as far as the muſcles. This inciſion ought to be made at one ſtroke, bringing the knife firmly and directly round the limb to the very point, by which means it cuts firm and ſmooth without bruiſing the parts. The knife beſt adapted for this purpoſe is repreſented Pl. 3. Fig. 3, 4. If, however, the ſurgeon happens not to be able to make the inciſion at once, he may certainly do it at twice. He then gives the amputation knife to an aſſiſtant, and with a

ſcalpel ſeparates the ſkin and cellular ſubſtance round the whole thigh, for about an inch and an half. Having then folded back the integuments, the aſſiſtant takes hold of them in that poſition with both hands; after which the ſurgeon again takes the amputation knife, which having ſet upon the muſcles juſt at the under edge of the folded up integuments, he cuts the firſt layer in a ſlanting direction upwards, as has already been directed. This is eaſily done by placing the knife in a proper poſition at firſt, and then, with your eye fixed attentively upon the heel of the knife, you divide the muſcles. The divided muſcles will inſtantly retract; and of this the ſurgeon muſt take the advantage, entering the knife as before; cutting in the ſame manner cloſe to the edge of the retracted muſcles, until he reaches quite to the bone. Having then ſeparated the muſcles from the bone, for at leaſt one inch, by means of a ſcalpel, the whole ſkin and fleſh is to be drawn up as far as divided by the metallic retractors, repreſented Pl. 3. Fig. 5.; and, after having properly adapted them to the bone, a circular inciſion ought to be made through the perioſteum with the ſcalpel, as cloſe to the retractors as poſſible. The ſaw repreſented Pl. 3. Fig. 6. is then to be applied and made uſe of with dexterity; which may eaſily be attained by any young ſurgeon at a

very few leſſons upon dry bones or hard wood. Thus only a ready uſe of this inſtrument can be learned; the directions given for this purpoſe being entirely of no benefit. Indeed, it is no leſs requiſite that the aſſiſtant that holds the limb be ſteady, than that the ſurgeon be dexterous in order to perform this part of the operation properly; for the leaſt change of poſition in the limb may incommode the operator to ſuch a degree as may cauſe him ſplinter the bone; and, when this accident happens, from whatever cauſe, the rough projecting points muſt be carefully taken off by the nippers.

After the bone is ſawn through, and the limb removed, the retractors muſt be taken away, and the ſurgeon having ſeated himſelf before the ſtump, is to cauſe the aſſiſtant raiſe it a little, that the light may fall perfectly upon it. He is then to pull out the femoral artery, and make a firm ligature upon it by means of a tenaculum. Having next removed all the clotted blood with a warm moiſt ſponge, the tourniquet is to be totally unſcrewed, in order to let us ſee every ſmall arterial branch which may require to be tied. The blood-veſſels being thus ſecured, the ſurface of the wound is once more to be cleared from the blood by a warm moiſt ſponge; after which the muſcles and ſkin are to be carefully drawn over the end of the bone, and laid cloſe to one

one another, as already directed; a large adhesive plaster, exactly of the breadth of the outside of the thigh, and six inches long, is to be applied to it. To the under end of this plaster, several pieces of narrow tape are to be sewed, about an inch distance from each other, throughout the breadth of the plaster. The inside of the thigh is to be fitted with another plaster of the same kind; the surgeon begins to apply a roller of flannel in the winter, and linen in the summer, to keep down the muscles and skin upon the bone, and prevent them from retracting. To keep this roller from falling down, it is first put round the patient's waist; the surgeon then begins from the top of the thigh to roll downwards, not too tight, but only as much as is sufficient to assist the plasters in preventing retraction. When the roller is brought near to the end of the stump, it must be fastened with pins. The surgeon then sits down again opposite to the stump, and having brought the opposite edges of the cut skin into contact, the two uppermost tapes are tied firmly opposite to the wound, which must thus be completely drawn together. The other tapes are to be tied in the same manner, fitting the parts to one another, and laying out of the way any of the ends of the ligatures of the vessels that may happen to interfere, and bring them out in a straight line with the

the veſſels they tie. By thus bringing the ſides of the wound into cloſe contact with each other, we have a perfect ſecurity againſt any collection of matter being formed in the internal parts, even about the ligatures of the arteries, which thus will act only like ſmall ſetons for a time, and then may be pulled out altogether, when they have ſeparated from the veſſels to which they belong. The end of the ſtump is laſtly to be covered with a large pledget ſpread with any kind of emollient ointment, over which a compreſs of fine tow is to be put; retaining it in its place by means of one broad croſs ſtrap of old linen paſſing up on both ſides of the thigh for ſeveral inches, ſo that it may be kept on by the roller, which ought to be paſſed ſeveral times round the end of the ſtump, after being pinned to the ſide, as has been already mentioned; and thus it may be made tight or ſlack at pleaſure, faſtening the whole with pins after it is paſſed a ſufficient number of times round the parts.

During the time that the roller is applied, the tourniquet is to be removed; but, as it is neceſſary to be able to ſtop any ſudden hæmorrhage that may occur, it is neceſſary to replace this inſtrument after the operation is over. Inſtead of the ſcrew tourniquet, however, in private practice, I always uſe the common one, as being much more readily tightened, in caſe of any ſud-

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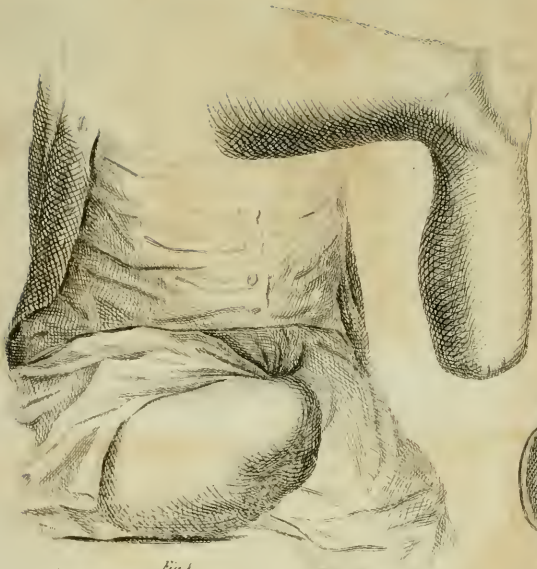

Fig. 1.

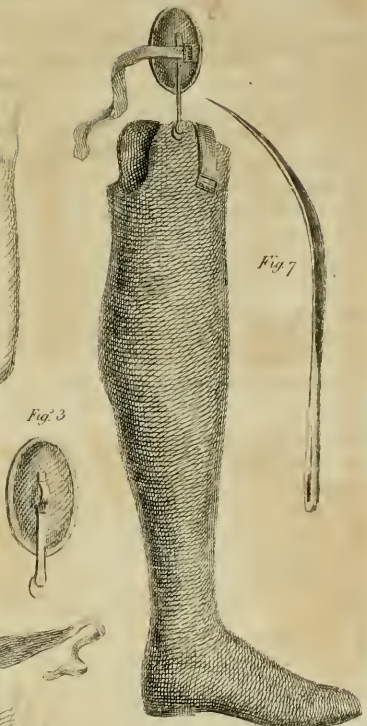

Fig. 7



Fig. 3

Fig. 5

Fig. 6.

Fig. 2.

den emergency, and likewiſe more ſteady than any inſtrument furniſhed with a large metalline ſcrew can be, which every motion of the bed-clothes muſt be apt to diſplace. It may alſo be left looſe as long as we pleaſe, without any uneaſineſs to the patient.

After the operation is entirely over, the patient is to be laid to reſt. His bed ought to be ſmooth, and very nearly level; but, if there is any difference, it ought to riſe towards the head and ſhoulders. The limb is to be laid upon a thin ſoft pillow, or ſome tow covered with linen; and, if the patient be diſtreſſed with ſtartings of the limb, or in danger of moving it in his ſleep, we may lay two ſtraps of linen acroſs the thigh, one near the end of the ſtump, and the other farther up; and, by pinning each end of them to the bed, on each ſide of the thigh, it will, in a great meaſure, be prevented from moving ſo much. A baſket or hooped frame is to be put over the limb to keep the bed-clothes from it; after which the patient ought to have an anodyne draught; and, as ſoon as he has taken it, the room ſhould be made as dark as poſſible, in conſiſtency with the attention neceſſary to be paid to the ſtump. The patient is now to be allowed to ſleep for an hour, if poſſible, which will generally refreſh him greatly. But, as hæmorrhages ſometimes take place ſeveral hours,

or

or even a day or two after the operation, the nurſe or attendant ſhould be ſtrictly ordered to attend carefully to the ſtump; and, if any hæmorrhage ſhould take place, to twiſt the tourniquet until it ſtops. Of this, however, there will be little or no danger, if the ſurgeon takes care to operate and dreſs the patient in the manner already directed; as thus the parts will mutually ſupport one another, and reſiſt, in a great meaſure, the impulſe of the blood through the arteries; while, at the ſame time, the wound being completely cloſed, it will be impoſſible either for the air, or any other irritating ſubſtance, to get admittance.

The ſpaſmodic affections which often take place after the amputation of a limb are to be attributed to the incluſion of the nerves along with the blood-veſſels, when the latter are tied up; but theſe can never happen, at leaſt in any great degree, where the veſſels are pulled out and tied by themſelves, in the manner formerly directed; much leſs have we to fear any tendency to tetanus. We cannot, therefore, be too careful to have blood-veſſels properly taken up at firſt; for, if we ſhall be obliged to undo the bandages, and to open up the wound afreſh, waſhing out all the glutinous matter which ought to be the rudiments of new fleſh, I heſitate not to ſay that it is worſe than a ſecond operation,

both

both on account of the real pain it gives, and the fear which is thereby induced on the patient. Indeed, I have repeatedly heard a patient cry out, (when the limbs bled afreſh, and it was neceſſary to undo the bandages in order to ſtop it), that he would rather have undergone a ſecond operation. What ſtruck me moſt forcibly on theſe occaſions was, that the bleeding arteries ſeemed to be thoſe which had eſcaped the operator's notice, or were thought, all the time of amputating, not to be worth minding.

If we ſhould ever happen to be under the diſagreeable neceſſity of performing this ſecond operation, the ſtump muſt be dreſſed, and the tapes tied, as has been already directed. It is ſcarce needful to ſay that they ought to be tied with a running knot, that they may the more readily be unlooſed in caſe of any urgency. Little or nothing more ſeems to be now requiſite, than to keep the patient cool, and on a low diet of milk or gruel, for ſome days; but, if the ſtump ſwells, and the patient complains of pain and tightneſs, we muſt obſerve whether or not theſe ſymptoms proceed from the bandage and compreſſion of the artery, or from the tourniquet. If neither of theſe be the cauſe, we muſt take off all the dreſſings without meddling with the bandage, at leaſt that part of it rolled about the thigh which is deſigned to keep the muſcles from

from retracting. The point of the ſtump is then to be gently touched all over the ſurface; and, if we find that the pain is much increaſed in this way, we muſt eaſe the part moſt complained of, by untying the ſlip knot of the tape above it; doing the ſame with all the reſt, and tying them ſlacker as we find it neceſſary for the eaſe of the patient. If the ſtump happens to be much ſwelled, we muſt apply ſeveral folds of linen moiſtened in a ſolution of ſugar of lead; and, if the patient is young, and has ſuffered little from the operation, the loſs of a few ounces of blood from the arm will be found highly beneficial. It will alſo be found uſeful to keep the patient's belly open by laxative clyſters. The beſt and moſt efficacious of theſe are formed of a ſtrong infuſion of ſena leaves, and chamomile flowers. A very proper mixture for this purpoſe may be made, by infuſing three drachms of ſenna with half an ounce of chamomile flowers, the infuſion ſtrained, and two ounces of oil added to it. This will always procure an eaſy and regular paſſage of the belly. I prefer injections to laxatives in all caſes of this kind; for the very obvious reaſon, that an injection will not move the body more than once or twice, while a doſe of phyſic may trouble him five or ſix times, and by obliging him to get up ſo frequently would probably hurt the ſtump.

It moſt commonly happens, that, in four days after the operation, the pain and tenſion on the thigh will be greatly relieved. If, at this time, the ſtump looks a little open and flaccid, we muſt tie the tapes more firmly, and bring the parts as cloſe together as poſſible. After the fourth day it may be cleaned once in twenty-four hours, covering it always with a pledget, ſpread with cerate, of ſuch a breadth as is ſufficient to extend over the whole wound. The ſides of it are always to be kept as cloſe together as poſſible, by tying the tapes firmly; and, by the ſixth day, the ligatures will generally come away, and the parts through which they paſs will be only thoſe which are not healed by the firſt intention. Theſe are eaſily cured, however, by putting an adheſive ſtrap upon the ſide of the ſtump immediately oppoſite to the ſinus, then pulling this ſide firmly down, ſo as to be in contact with the other; then bringing the ſtrap directly acroſs the wound oppoſite to the ſinus, and faſtening it upon the other ſide. By this method, in no longer time than thirty hours, the ſides of the ſinuſes will be completely healed, and their ſides adhere together throughout their whole extent. The ſtump muſt be gently raiſed by an aſſiſtant every time it is dreſſed, and the roller, as well as all the dreſſings, taken off. But, though it be neceſſary to look at the

end of the ſtump every day to ſee how matters are, yet there is no neceſſity for taking off the whole of the roller, if it continues tight. It will be ſufficient to do this only three or four times in the time of the cure; and, as no ſuppuration can take place within the wound, except what little takes place about the ligatures, we have no occaſion for any thing but the plaſter to keep the air from the wound, dreſſing the end of the ſtump as already directed.

As ſoon as the pain and inflammation of the wound are nearly gone, we muſt certainly deſiſt from exhibiting any medicine that has a tendency to debilitate the patient, and we muſt only keep his bowels gently open; but, we muſt always remember, that, if we allow the inflammation to run ſo high as to end in ſuppuration, there is an end of all hope of healing by the firſt intention; but this can only happen from miſmanagement; for, in fact, nothing in nature is better authenticated than that the ſides of a recent wound in any part of the human body, made by a clean and ſharp inſtrument, will preſently unite, if they are placed in contact with each other, and kept ſo for ſome time, without any matter being formed. I muſt, however, repeat, that much of the ſucceſs of this operation depends upon the application of the roller, which ought never to be made too tight. This is frequently the

the cauſe of great uneaſineſs to the patient, as well as the tightneſs of the tape ligatures, and both ought to be corrected as ſoon as diſcovered. The ligatures may be known to be too tight, by the prominence of the parts of the ſtump between them; and, whenever this is the caſe, we muſt inſtantly untie them, and only give ſuch a degree of tightneſs as the patient can eaſily bear. Having then covered the end of the ſtump with a pledget ſpread with Gowlard's cerate, we muſt apply over it ſome cloths dipped in a ſtrong ſolution of ſugar of lead, uſing alſo the other means to reſolve the inflammation which have been already mentioned; for, if ſuppuration once begins to take place, we will not eaſily prevent it from going to a great height.

I muſt here take ſome notice of what is ſaid by a modern writer on the ſubject of amputation. He tells us, that we *ought not* to attempt the cure of a ſtump by the firſt intention; becauſe the ſkin is apt to be puckered up and wrinkled, and the ligatures of the arteries are withdrawn with difficulty, when a ſtump heals ſuddenly, and the edges of the wound adhere by the firſt intention. But this objection would hold equally good againſt healing the ſtump by any method whatever; for, in all of them that I ever ſaw, the ſkin was wrinkled and uneven;

even; but it muſt be owing to an error on the part of the ſurgeon, if it is more ſo when healed by the firſt intention, than by any other; and it then ſhows that he has not been careful in applying the ſides of the wound to each other, after the operation was performed. Let us ſuppoſe, that, after a ſurgeon had extirpated a ſmall cancerous tumor on the lip, he found the cicatrix rough, uneven, and higher on one ſide than the other, would he ever ſuppoſe that this was owing to its being healed by the firſt intention, rather than any other way? Surely, if he did ſo, it would be a moſt ridiculous ſuppoſition, and he muſt certainly be conſcious that the fault was entirely his own. It is evident that the caſe muſt be the ſame whether the wound be great or ſmall; and that the argument will hold as good with the ſore left, after the amputation of a thigh, as any other. But, as an irrefragable argument in favour of the mode of operating above recommended, I have repreſented two caſes of ſtumps healed in this way, Pl. 4. Fig. 12. where it is evident the cicatrix is very little wrinkled. With regard to the other part of our author's objection, viz. the difficulty of removing the ligatures, I muſt certainly ſay that it is of as little ſignificance as the former; and I can affirm, that, in very many of the caſes of amputation, where the wound was cured

ed by the firſt intention, the ligatures were puſhed out by the matter on the ſixth day. I have indeed ſeen ligatures remaining in the wound after the cure had been protracted for three months; but this was not owing to the wound having been healed by the firſt intention, but to the ſurgeon having included too large a portion of the muſcle in it along with the blood-veſſel. Many ſuch caſes have fallen under my obſervation; and in ſome I have even ſeen the ſurgeon under a neceſſity of opening the wound afreſh, and cutting out the ligature, while moſt of thoſe on whom I operated were perfectly cured in fifteen days, the ligatures having come out at the time already mentioned.

I ſhall only further obſerve, that I have ſeen inſtances of the integuments having been wounded a ſecond time while the operator was cutting the muſcles. But this proceeds from his inattention in not making the knife follow his eye; for, if he makes the knife the director, and only looks after it to ſee which way he has cut, there can be no doubt that he will err egregiouſly. It would be proper indeed for a ſurgeon to exerciſe himſelf with a piece of wood covered with ſeveral folds of leather, attempting to cut the one quite round, without injuring the other, until he becomes ſo expert that he can perfectly divide the one without even ſcratching that which lies below it, and at laſt divide the under-

moſt

moſt without ſcratching the wood. Indeed it ſeems to be abſolutely neceſſary for every ſurgeon to practiſe his operations as far as poſſible upon inanimate matter before he does ſo upon the human body; the mode of operating will always be found the ſame; and it is inhuman to put any patient to pain which we might avoid, by making the experiment on a piece of inſenſible matter. As to the pain of the operation which may be ſuppoſed to be increaſed by ſo many inciſions, it is certain, if the ſurgeon is dextrous at his buſineſs, they are quickly done, and the pain is thereby very much diminiſhed, and the diſſection of the ſkin and muſcles with a ſmall ſcalpel is eaſier than with a large amputation knife, as the latter can never be made uſe of with the ſame dexterity.

The different inſtruments neceſſary for amputation are repreſented Pl. 3.—Fig. 3. 4. ſhew the ſtraight knives. Fig. 5. the retractors made of iron. Fig. 6. the ſaw. Fig. 8. the catiline. In the caſes afterwards to be related, it will appear that the patients were generally able in twenty days to walk about with a crutch, the ſtump being quite round, plump, and ſmooth. The operation ought always to be performed as low down in the thigh as poſſible.

SECT.

## SECTION IV.

### *AMPUTATION OF THE LEG.*

In amputating the thigh, it is proper, as has been above remarked, to make the ſtump as long as poſſible, it being always found the more uſeful to the patient the longer it is; but, when the leg is to be amputated below the knee, this is not found to be the caſe; and it is likewiſe found to be difficult to cover the end of the ſtump well with ſkin, unleſs the limb be taken off at a certain part. There are two methods recommended for performing this operation: Firſt, by dividing the ſkin and muſcles, by a circular inciſion reaching at once to the bones. The muſcles between the two bones are then to be ſeparated from them, by the knife called the catiline, for a conſiderable way. The blood-veſſels being then accurately taken up, and having divided the bones, we muſt bring the edges of the wound together, and retain them until they unite. In this way, however, by reaſon of the great want of muſcles on the anterior part of the leg, the cures were very tedious, the ſtumps were always pyramidal; and

and the health of the patient was often greatly impaired, by reaſon of the length of time the ſore continued open. The next method was by attempting to ſave a very large portion of the ſkin and muſcles of the back part of the leg to cover the ſtump on the fore, as well as back part, and this was called the *flap operation.* The differences about the place where the amputation is to take place, however, are not leſs remarkable than about the mode of performing it. Some recommend it to be done juſt below the knee, others as near the ancle as poſſible, while others inſiſt that it ought to be done above the knee. This laſt, however, I think is evidently erroneous; for, by ſaving the joint of the knee, the patient can reſt his whole weight upon it with only a cuſhion in the bottom of the machine, which ſerves as an artificial limb. But no perſon can reſt upon the top of a ſtump, or almoſt ſuffer it to touch the bottom of the box, ſo that the whole weight of the body muſt reſt upon the bed of fleſh made by the muſcles in the middle of the thigh, which is put into the box; and the inſide and mouth of which are ſtuffed with cuſhions for that purpoſe, ſo that the end of the ſtump is not allowed to touch the bottom by ſome inches. I ſhall therefore endeavour to point out, in the firſt place, the moſt proper

parts for performing the operation for amputating the leg.

There are two places, in my opinion, where the leg may be amputated to advantage: 1. Near the ancle joint; and, 2. Some way below the knee. To judge of this aright, we muſt obſerve, that, when any diſeaſe in the foot or ancle occurs, that part ought to be pitched upon where the uſe of the knee joint will be the leaſt injured, as this is always ſo uſeful to the patient, and gives the greateſt firmneſs and ſtability to the artificial limb. Legs of leather, or of blocked tin, have been uſed with much ſucceſs; and theſe being made to reſemble exactly the natural limb, have enabled the patient, with a ſhort firm ſtick in his hand, when properly fitted, to walk with almoſt as much eaſe and celerity as with his own limb.

In performing this amputation, the patient muſt be placed upon a table, as in amputating the thigh. The tourniquet ſhould be applied immediately above the knee, having previouſly put the cuſhion upon the artery in the ham; the foot and leg being ſecured by an aſſiſtant; and, for the greater convenience of the operator, the patient ought to be laid a little to the oppoſite ſide. The ſurgeon then ſtanding between his legs, and making an aſſiſtant pull up the ſkin, is to make an inciſion through the ſkin exactly thirteen times the breadth of his thumb

from the center of the patella along the courſe of the tibia, or twelve inches by meaſure from the ſame place. Having made the circular inciſion with the amputation knife through the integuments, we ought immediately to ſeparate as much of the ſkin and cellular ſubſtance from the muſcles and forepart of the tibia as we think will cover the end of the ſtump. The muſcles and bones are then to be divided as already directed in the amputation of the thigh; thoſe between the tibia and fibula are to be divided by the catiline, and ſeparated accurately from the bones by its point, for about an inch and an half. We are then to have a piece of linen divided into three parts, as repreſented Pl. 3. Fig. 9. the middle ſtrap of this is to be put through between the bones, and the other two on each ſide, keeping the undivided part of the cloth backward where only there is any occaſion for it, it being ſufficient to fold back the ſkin on the forepart; and this ought to be done before the operator begins to divide the perioſteum. The linen being thus applied to protect the ſoft parts from the ſaw, the latter is to be applied to both bones at once on the outſide of the leg. As ſoon as the bones are divided, we ought to begin to take up the veſſels, which ſhould always be done with the greateſt care; for almoſt all the hæmorrhages that happen after amputations ariſe from want of attention in tying up the veſ-

ſels

fels at firſt. Thoſe being ſecured, the teguments and muſcles on the back part of the ſtump are to be brought forward to cover the end of it, and to be ſecured in their places with adheſive plaſters in the manner directed in amputation of the thigh, placing them firſt on one ſide, and then on the other, and drawing them alternately, until the ſides of the wound are in perfect contact with each other. A roller is then to be put upon the under part of the thigh, and ſeveral ſpiral turns made with it round the knee joint; but the roller is to be particularly applied to prevent the retraction of the muſcles on the hinder part of the leg; and it will be found more uſeful in this reſpect where the flap operation has been performed than in others; as in this they require, if poſſible, to be kept more free from retraction than otherwiſe.

In all caſes where we ſeparate the ſkin and cellular ſubſtance from the bones and muſcles, it ought to be done completely, by taking the whole of the cellular ſubſtance; but this is more particularly neceſſary to be attended to in caſes of this kind, as, on the anterior part of the tibia, the circulation of the ſkin may become languid, and thus retard the cure. As the cellular ſubſtance alſo in this caſe is a little more denſe than in other parts, the ſurgeon will find it neceſſary to be a little more careful in the ſeparation of the cellular

lular parts from the pereoſteum than in any other part of the extremeties.

When a limb happens to be fractured, or diſeaſed in ſuch a manner as to require amputation, to ſave the patient's life, we ought to be particularly careful in aſcertaining the exact place where the operation is to be performed. This, as we have ſeen, ought always to be below the knee, when the diſeaſe is ſituated between the ancle and the knee joint. The latter ought always to be ſaved for the very purpoſe of reſting the weight of the body upon it, as this never can be done upon a ſtump. For this purpoſe, we ought to perform the operation as low down as poſſible, both that we may ſave the flexor muſcles, which are inſerted conſiderably below the head of the tibia, and that we may prevent a great number of the cancelli from being affected by the air; for the nearer we amputate to the head of the bone, the more of theſe will be cut; while, though we may ſave much of the integuments, we will find it difficult to make them unite by the firſt intention. If we do not ſucceed in this, the patient will frequently be in danger of dying hectic, from the great diſcharge of fetid matter which takes place. This diſcharge is owing to the corruption of the fluid contained in cancelli, the bony parts of which alſo are liable to become carious. The beſt

general

general rule here is, never to divide the bone higher up than an hand-breadth below the condyle of the tibia; and in this ſurgeons and anatomiſts are very generally agreed. This place by meaſure will be about four inches below the condyle, where the bone is much more ſolid; but the ſurgeon muſt begin his inciſion at leaſt two inches and an half farther down, or as near the edge of the ſore as poſſible, in order to ſave two inches and an half of ſkin and cellular membrane. Having divided the integuments and muſcles, ſeparated them from the bones, and proceeded in every reſpect as already directed, I would adviſe ſurgeons, in caſes of this kind, to unite the ſides of the wound by the twiſted ſuture. For this purpoſe he muſt provide himſelf with a dozen of flat gold pins, an inch and an half long. After the parts are properly adapted to one another, the operator is to introduce one of theſe exactly at the upper part of the wound, wraping round it a waxed thread as directed for making the twiſted ſuture. The other pins are to be introduced in the ſame manner, at the interval of half an inch from one another, until all parts of the wound are thoroughly ſecured, taking care always not to include the ligatures of the arteries, but to leave them hanging out between the pins oppoſite to the veſſels to which they belong. A large pledget ſpread with Goulard's cerate is to

be

be applied over the end of the ſtump, the ointment being put on pretty thick. The pledget is to be covered with a compreſs of tow, a piece of folded linen, and a bandage over all, as already directed; only that part of it which goes round the limb below the knee muſt be made pretty firm, in order to prevent the muſcles from retracting, and to make the preſſure on the pins as little as poſſible.

In a number of caſes to be afterwards mentioned, in which the patients were treated in this way, the wounds healed by the firſt intention, without any formation of matter; even without any inflammation; nay, almoſt without any complaint after the operation. The wound was inſpected morning and evening, and the pledget renewed at thoſe times. After the wound was healed, the ſtumps appeared quite round and ſmooth, without any inequality. I do not ſay, however, that in *all* caſes the operator will be equally ſucceſsful; in certain conſtitutions, inflammation will take place; but, when it does ſo, it ought always to be moderated by topical applications, which it is in every ſurgeon's power to do; for, if it is allowed to go on, I believe it will always end in ſuppuration, by which means the cure will be very much retarded.

Where the diſeaſe is ſeated ſo high up, that we cannot amputate at the place I have mentioned,

ed, we ought by no means to perform the operation below the knee, as it is a thouſand to one if we be able to effect a cure in four or five months; and I have ſeen limbs amputated too high up diſcharge ſuch a quantity of fetid matter, to which it was abſolutely impoſſible to put a ſtop, that the unhappy patient has expired in miſery, ſix months after the operation.

I muſt, however, caution the young practitioner when reading what is advanced by a modern writer on ſurgery on this ſubject, and who adviſes us to amputate either a little above the ancle, or above the knee. The truth is, that the modern improvements in amputation conſiſt entirely in preſerving the wound from the contact of the air, by which it heals in the eighth part of the time it would otherwiſe do; and any other pretended improvements muſt have originated only from ignorance. No mechanic who ever made an artificial limb has ſeen a man that could reſt his body on the point of a ſtump, though ever ſo full and plump to appearance. I have the teſtimony of the perſon who has been employed by the hoſpital in this city for upwards of twenty years, in making wooden limbs for the poor patients, that not one of them could reſt himſelf on the end of the ſtump, even though a cuſhion of the ſofteſt kind was put into the machine for this purpoſe. He never ſaw but two perſons who attempted

attempted to perſevere in doing ſo. The one was a gentleman, whoſe limb was amputated above the knee, who had the bottom of his box fitted with a cuſhion of the ſofteſt and moſt elaſtic materials, with a depreſſion in the middle, for holding the ſtump as conveniently as poſſible. Notwithſtanding all the care that could be taken, however, he always felt conſiderable uneaſineſs in walking; but perſevered in the uſe of this machine, until the end of the ſtump became chafed, inflamed, and at laſt ulcerated. It was, then, from neceſſity, laid aſide; but, after the ulcer was cured, the gentleman had recourſe to it again. The bad ſymptoms returned in a ſhort time, ſo that he was finally obliged to have recourſe to a limb of the ordinary conſtruction, where the whole weight of the body lies upon the upper and back part of the thigh. The other caſe was that of a perſon who had his leg amputated a little above the ancle; and, that he might as much as poſſible avoid deformity, had half a boot made of hardened leather, in which a ſoft cuſhion was put for the ſtump to reſt upon. This was attended with the ſame effects as the former; a fixed pain and uneaſineſs were conſtantly felt in the end of the ſtump; ſo that, after perſevering in the uſe of this boot for a twelvemonth, with great difficulty he was obliged to throw it aſide, and get an artificial leg

made, on which the joint of the knee reſted, with the reſt of the leg ſticking out behind. This caſe was perhaps as fair a trial of the practicability of the method in queſtion, as can ever be obtained. The amputation was performed by the late Dr Aitken, who alſo contrived the machine. The ſtump was covered with a flap, and was extremely plump and round. The cure was performed in fifteen days; and, in ſix weeks, the machine we ſpeak of was tried. The cuſhion, as we have ſaid, was quite ſoft, and put into the bottom of the boot; the latter being fixed with ſtraps to the limb on each ſide, faſtened round, both below the knee joint and above it; the whole being ſupported by a circular belt around the waiſt; ſo that, thus, the boot was always firmly ſupported in contact with the end of the ſtump, and upon the limb.

I have juſt now mentioned that this young gentleman was obliged at laſt to have recourſe to an artificial limb, upon which the knee joint reſted; the reſt of the leg ſticking out behind him. This is moſt evidently very inconvenient; and from this circumſtance alone ariſes a very ſtrong argument againſt amputations near the ancle, but taking off the limb as near the head of the tibia as poſſible, the central point of reſt being the patella, upon which the whole weight of half the body lies. That part of the limb

which is preſerved, being only uſeful for giving ſteadineſs to the ſtump, which might otherwiſe be apt to ſhift from ſide to ſide, if not prevented by the piece which jects out behind, and is inſerted between the two ſides of the wooden leg. Notwithſtanding this, however, we ought always to operate upon the lower part of the limb, where the patient is in ſuch circumſtances as to be able to afford an artificial limb of hardened leather, exactly of the ſize of the other. When a limb is to be amputated with this view, the length of the ſtump ought never to exceed nine inches; for, when it does, that part which is longer, is, by the motion of the limb, continually impelled againſt the ſides of the machine, ſo as to irritate and inflame the whole of that which exceeds the juſt length. But, in every caſe where the ſtump does not exceed nine inches in length, no uneaſineſs is felt. The upper part of the limb muſt always be wrapped about with a flannel roller, that it may fill up the machine; and which has alſo a very great effect in preventing the effect of friction on the end of the ſtump; and this is the true reaſon why ſurgeons ought to be at ſuch pains to take off the limb at the exact ſpot which experience has determined to be the moſt proper. One of the machines proper for thoſe who have their limbs amputated

amputated in this way is repreſented Pl. 4. Fig. 3.

I ſhall only further remark, that it is impoſſible to perform the flap operation very near the ancle, for this obvious reaſon; that here the tendons of the muſcles begin to be formed; and, particularly where the flap is formed on the back part of the limb, we meet with nothing but ſkin, cellular ſubſtance, and the tendo achillis. When the limb is to be amputated below the knee, as directed, if the ſurgeon cannot truſt his eye, muſt make a line with ink round the leg, which we may call an *oval circle*; for, though it only encompaſſes the leg, yet it muſt come down conſiderably farther on the back part of the limb, than the fore part, ſo that the ſtump, when cut off, will be oval. The deſcent on the back part muſt be ſufficiently great, to allow the flap formed by it to cover the whole ſtump, and join exactly with the ſkin on the oppoſite ſide. Having performed the operation, and ſecured the ſtump in the manner already directed, by means of the interrupted future, we are next to apply long adheſive plaſters from the ham downwards, between each future upon the fore part of the leg, to the joint of the knee, taking care that the pins be not farther diſtant from one another than three quarters of an inch,

inch. If there is any appearance of ſwelling, tenſion, and inflammation, we muſt apply a number of leeches all over the flap, as has already been mentioned under the head of inflammation, the diſcharge being promoted by warm cloths dipped in a ſtrong ſolution of lead. In ſhort, the wound is to be treated in every reſpect as we would do a recent wound in any other part of the body. The common practice, however, is very materially different from what I have recommended. The ſurgeons, inſtead of attempting to prevent ſuppuration, as I have recommended, always allow it to take place, nay, even promote it by warm poultices, till granulations of fleſh appear; a practice forever to be reprobated by every intelligent perſon. In general, the pins may be removed in eight, nine, or ten days, the ligatures having come away ſome days before. The ſtraps may be allowed to remain until the cicatrix has acquired ſufficient firmneſs, and the ſtump does not feel painful in handling it pretty firmly; which will generally happen about the fifteenth day. From the great ſucceſs I have met with in this mode of operating, I am clearly of opinion that it is the only one which ought to be adopted immediately below the knee, when the teguments are found for any ſpace on the back of the

the leg; and, I am alſo convinced, that the method I have recommended in amputating the thigh entirely ſuperſedes the neceſſity of any flap operation there; however, ſuch as have a mind to ſtudy it, may look into the ſyſtems of Mr Bell and Mr Halloran, where it is fully deſcribed.

## SECTION. V.

### *OF AMPUTATING AT THE HIP JOINT.*

THIS has juſtly been conſidered as one of the moſt formidable and dangerous operations that can be performed on the human body, and may truly be reckoned a deſperate cure where it ſucceeds, which I believe it ſeldom does completely. This want of ſucceſs is owing, in the firſt place, to the large ſize of the inguinal artery, and, in the next, to the extenſive ſurface of the wound, which renders the ſmalleſt acceſs of air exceedingly detrimental. It ought never, in ſhort, to be attempted, but as the laſt reſource to ſave life; and then only when we can ſave as much of the ſkin and muſcles as will cover the ſore, as well as when there is a probability of ſtopping the

the hæmorrhage, and preventing it from returning. The cauſes which render this amputation neceſſary have been already treated of, particularly gunſhot wounds, very extenſive caries, with ſuppuration, &c. When the operation is to be performed, the patient muſt be laid upon a table on his back, the limbs being ſeparated, and ſecured by aſſiſtants, as well as the reſt of his body. The ſurgeon ſhould now divide the ſkin and cellular membrane longitudinally, for at leaſt ſix inches, beginning at the top of the thigh exactly below Poupart's ligament. He then divides the faſcia lata, beginning to ſcratch it an inch and an half below the ligament. After it is fully divided, we muſt introduce a directory, and, putting a ſcalpel into its groove, divide the faſcia with it, after having laid the artery fully bare for near three inches. Below it we muſt introduce a blunt arched needle, armed with a ligature; and, having paſſed both ends of the ligature through below the artery, we withdraw the needle, by running it along one end of the ligature. Thus the ligature is left alone below the artery, which is then to be tied up as formerly directed. The ligature is to be made about two inches and an half below the place where it comes out below the ligament. We muſt next introduce another about an inch farther down on the artery, and divide the veſſel in

in the middle between the two. The patient is then to be turned to his oppoſite ſide, when the ſurgeon is to make a circular inciſion immediately below the trochanter major of the femur, dividing at once the ſkin, cellular ſubſtance, and faſcia. Theſe muſt be retracted upwards for at leaſt an inch, when the whole muſcles are to be divided at one cut to the bone with a ſcalpel; then we begin to divide the muſcles on the poſterior part of the thigh, a little above the upper part of the great trochanter, continuing the cut downwards in a right line, until we come to the circular cut already made, and thus divide all the integuments down to the joint. A ſimilar cut is to be made on the anterior part of the thigh, at a ſmall diſtance from the artery, and this cut muſt alſo reach quite down to the bone. The ſkin and muſcles are then to be ſeparated from the bone and joint, and theſe pieces of fleſh or flaps are to be retracted by an aſſiſtant. Every blood-veſſel muſt be taken up by the tenaculum, as it appears; and thus the hæmorrhage being entirely ſtopped, and the joint laid bare, we muſt next proceed to divide the capſular ligament with the ſcalpel, from the edge of the acetabulum, completely round the joint; the limb is to be turned inward, and elevated ſo that the ligamentum rotundum may be brought ſo much in view

as

as to be divided by the point of the ſcalpel. Having then removed the limb, we can now examine the acetabulum and bone. When theſe appear ſound, we muſt endeavour to heal the wound by the firſt intention. To accompliſh this, we muſt bring the two flaps, as near as poſſible, into their natural ſituations, drawing them together throughout the whole extent of the wound, keeping them in their places by adheſive ſtraps, and ſecuring them by the twiſted future. A large compreſs of tow is to be put over the wound, with another of linen above it, and a broad flannel bandage over all, wrapped ſeveral times round the body, once or twice over the end of the ſtump, and pinned to the roller before on the fore part of the abdomen. Here, as in other caſes, we muſt take care to leave out all the ends of the ligatures, that they may be taken away at a proper time without doing any injury.

Having dreſſed the wound, we muſt then lay the patient to bed on his oppoſite ſide, and treat him with the utmoſt attention, as no tourniquet can here be applied to ſtop the hæmorrhagy, if any ſhould occur. The greateſt care muſt be taken to prevent inflammation, and every ſymptom of fever that may ſucceed the operation, by the uſe of every topical remedy recommended

under that head. The ligatures will generally come away upon the ſixth, ſeventh, or eighth day; and we muſt by no means attempt to remove them till we are ſure that they have ſeparated from the ends of the veſſels. It will alſo be neceſſary, if the patient is young and plethoric, to take away eight ounces of blood from his arm every ſecond day, for the firſt eight days. The reaſon of this is obvious. The body has now loſt a very conſiderable portion of its ſubſtance, notwithſtanding which the ſame quantity of blood continues to be ſecreted for ſome time; and hence it muſt accumulate in a great proportion, though at length the digeſtive organs accuſtom themſelves to the ſize of the body they have to provide for. For the ſame reaſon, it is obvious that the patient ought to be kept on a very low diet for a long time after the operation has been performed, nay even after the wound is nearly cured. The dreſſings muſt be removed as in other caſes; only we muſt here be at more pains to prevent inflammation, as the wound is greater, and the patient in more danger than any other caſe in ſurgery. Every topical remedy that can be uſeful in large and extenſive wounds muſt be uſed here to prevent ſuppuration, or even any inflammatory ſymptoms from taking place; and, by carefully attending to this method, we may ſometimes ſucceed in

accompliſhing a cure. There is ſeldom any danger of hæmorrhage, if the artery be tied up the manner above directed; but if, by accident, it ſhould happen otherwiſe, which can only be by the forcing off the ligature, we may introduce another below it, nearer to Poupart's ligament, to act as a tourniquet, until we can again tie the artery in its proper place. Here alſo it is evident that we have it in our power to make the wound much leſs; for the tourniquet can never be applied with effect higher up than the under edge of the great trochanter. By making the circular inciſion, therefore, about two inches lower than the trochanter, we make the wound much ſmaller than it would otherwiſe be, and of conſequence the cure will be more eaſily and ſpeedily accompliſhed.

## SECTION VI.

### *OF AMPUTATING THE FOOT, TOES, AND FINGERS.*

When the joint of the ancle is diſeaſed, or the bones of the tarſus or metatarſus become carious, we muſt amputate above the joint, according to the directions already given; but, when

when only one or two of the toes are affected, they muſt be taken away at the joint in the following manner. A circular inciſion is to be made on the toe about the middle of the phalanx, which inciſion ſhould be carried quite down to the bone. Another equally deep ought to be made, beginning at the circular one, and extending downwards to the joint of the phalanx with the metatarſal bone. A third is to be made on the oppoſite ſide of the toe, exactly in the ſame direction, and of the ſame depth. Thus we have two flaps of ſkin and cellular ſubſtance to cover the wound, as in other caſes of amputation; but, in general, it will be found neceſſary, after the bone is taken away, for which purpoſe the flaps muſt be carefully ſeparated from it, to take off a ſmall portion from the uppermoſt flap, that the other may completely cover and defend the end of the joint. Here it will be proper to keep the edges of the flaps in contact, by means of the twiſted future; two pins on the anterior part, and one on each ſide, will be ſufficient. If any ſmall artery happens to be divided, it may be taken up with the tenaculum, but it is ſeldom of ſuch conſequence as to require any operation. I muſt here, however, remark, that we cannot by any means retain the parts in contact by means of adheſive plaſters. I have ſeen this attempted, but never

one

one of the patients cured without a great ſuppuration and diſcharge of matter taking place, by the acrimony of which the adjacent parts were injured. This, however, will not happen, if the edges of the flaps are kept in perfect contact by means of the twiſted ſuture, for it is the contact of the external air that produces all the miſchief.

After the operation is over, we muſt dreſs the wound with a pledget ſpread with mild ointment, with a compreſs and roller, as in other caſes, and the parts will generally be united in eight or ten days. But, where any of the metatarſal bones are affected, if they happen to be on the outſide of the foot, and we are ſure that the diſeaſe reaches no further than to the junction with the tarſus, the diſeaſed bone ought always to be removed at once, to ſave the whole foot from being affected. When this is to be done, the patient muſt be laid upon one table with his foot upon another, the limb being held firmly by an aſſiſtant. The tourniquet is to be applied in the ham, in order to prevent any danger of hæmorrhagy. The ſurgeon then divides the ſkin, from the joint of the toe to the joint of the tarſus; after which, he carefully and quickly diſſects away the integuments from the bone, ſeparating them laterally. Having done this, he next endeavours to diſſect away the bone from

from the integuments on the ſole of the foot, by firſt raiſing, with a double edged ſcalpel, that part of it next the toe, then diſſecting away the ſoft parts quite up to the tarſus. The joint will be eaſily diſcovered, by making the bone turn round upon the tarſus; after which, the capſule is to be divided, and the bone taken away.

Having removed the bone, we muſt allow the artery to ſpring, and then take it up by the tenaculum; but, as here we are not always able to take up both ends of the veſſel, we muſt uſe the other methods of ſtopping blood formerly recommended, by compreſs, ſtyptics, &c. The ſides of the wound are then to be brought into contact, and preſerved in the cloſeſt union we can, by ſtraps of adheſive plaſter, laying over the whole wound a large pledget, a compreſs of tow, another of linen, and wrapping round all theſe dreſſings a flannel roller. It may be neceſſary at firſt to make the bandage ſo tight over the end of the wound next the tarſus, that it will give the patient ſome uneaſineſs; but, as ſoon as we have reaſon to believe the patient is out of all danger of hæmorrhage, that is, ſome hours after the operation, we may ſlacken it, and the uneaſineſs will go off. The limb and foot muſt be laid in the moſt eaſy poſture, and great care is to be taken that he do not move it; his body is to be kept cool, and

every

every method uſed to prevent inflammation. The bandage and compreſſes may be removed in four days. On removing the pledget, if the dreſſings on the upper part ſhould remain firm, a ſmall poultice of bread and milk, of the exact ſize of the dreſſings, may be applied to ſoften them. If any of the plaſters have become looſe, they muſt be renewed, and the ſides again drawn into contact and ſecured. As ſoon as the dreſſings are thrown out of the wound, and the latter has a ſound healthy appearance, with a proper ſuppuration over its ſurface, we ought to bring the ſides into contact, and keep them ſo till they adhere; the ſore muſt be regularly inſpected every day, and the edges kept in contact, while the air is excluded by the pledget. Thus the ſore will very ſoon heal, and the patient recover the uſe of his foot; and, in the ſame manner, we may take away two or more of theſe bones; but I am decidedly of opinion that we ought never to uſe the ſaw to divide a metatarſal bone from the tarſus; for then the injury done to the ſoft parts is ſo great as to endanger the loſs of the patient's foot, or even his life; but it can never happen when the above method is practiſed. The patient, if the operation has been well performed, and the cure gone on ſucceſsfully, may be able to walk with tolerable eaſe,

caſe, by means of a ſtuffed ſhoe, after one or more of theſe bones have been removed.

## SECTION VII.

### *AMPUTATION OF THE ARM OR FORE ARM.*

THIS is performed exactly as in the thigh and leg, ſo that the directions for the one will be ſufficient for the other. In both the ſides of the wound are to be united by the firſt intention, and the parts kept in contact for that purpoſe by a twiſted ſuture.

## SECTION VIII.

### *AMPUTATION OF THE ARM AT THE SHOULDER JOINT.*

AMPUTATIONS of this kind, as well as thoſe of the haunch-joint, are both difficult and dangerous; ſo that we ought never to attempt them when we can amputate lower down. Extenſive caries, however, and compound fractures, eſpecially

cially thoſe occaſioned by gunſhot wounds, ſometimes render it neceſſary to take off the limb at the very joint. In performing it, an accurate ſkill in anatomy, as well as much vigour of mind and reſolution, are neceſſary on the part of the ſurgeon. The patient is to be laid upon his back on a matreſs put upon a table of a proper height, and well ſecured by aſſiſtants. He muſt then be brought as near the edge of the table as poſſible, ſo that the arm and ſhoulder may be freely moved in every direction. The circulation of blood in the arm is next to be ſtopped, by compreſſing the ſubelavian artery as it paſſes over the firſt rib; for which purpoſe we apply a compreſs upon it immediately above the cavicle. The compreſs is to be kept on by a ſtrong aſſiſtant; and the preſſure will be known to be ſufficiently ſtrong when the pulſe at the wriſt totally ceaſes. The ſurgeon then, with the amputating knife, makes a circular inciſion through the ſkin and cellular membrane to the muſcles, which ought to be done immediately at the inſertion of the deltoid muſcle. The aſſiſtant retracts the integuments for an inch or two; the knife is applied immediately to the arm at the under edge of the divided ſkin, after which the muſcles muſt be divided down to the humerus at once, directing the knife perpendicularly, as well as circularly. Thus the muſcles

being divided with a firm ſtrong ſcalpel, he ſeparates them from the internal edge of the acromion downwards, to the circular inciſion, which terminates about an inch from the brachial artery. Another cut is to be made on the back part of the head of the arm, beginning as high as the other, and terminating in the circular inciſion. Both theſe are to be made quite to the bone from the ſuperior part of the joint to the circular inciſion; after which the muſcles muſt be diſſected from the bone to the very back of the joint, both above and below. Theſe parts, forming two flaps, are nearly of an equal ſize. The brachial artery is to be tied up with the tenaculum immediately after being divided by the circular inciſion; and all the other arteries of any conſequence muſt alſo be taken up. The muſcles being then ſeparated from the bone, we muſt divide the capſular ligament with a ſcalpel, which will enable us to remove the limb altogether. The two flaps are then to be drawn over the wound, ſecured in their places by the twiſted future, and a pledget of Goulard's cerate, with proper bandage and compreſs put over the wound. After the firſt eighteen hours this pledget is to be regularly ſhifted, morning and evening. A cuſhion or two ought to be applied on the joint, a compreſs of linen over that, and a moderate preſſure kept up by the flannel roller;

ler; for this is of great conſequence to promote the union of the parts. Every attention is neceſſary to keep down inflammation, by veneſection and other methods ſo often recommended; and if any hæmorrhage takes place, it muſt be ſtopped by compreſſing the artery above the clavicle, as already directed, until the ligature can be again properly applied. It may be obſerved that the artery ought to be inſtantly tied when the parts are divided; for the aſſiſtant may be tired if he be obliged to make ſuch a ſtrong preſſure during the whole of the operation. Some practitioners have adviſed to ſcrape off the cartilage from the glenoid cavity of the ſcapula; but this muſt never be thought of, for the parts will always unite ſufficiently without it.

## SECTION IX.

### *AMPUTATION OF THE ENDS OF CARIOUS BONES IN DISEASED JOINTS.*

THIS operation is much more ſeldom practiſed than amputation of the extremities; but, as the end of a bone may ſometimes happen to be diſeaſed where all the other parts are ſound, it has been

been propoſed, particularly in the knee and elbow joints, to take off the diſeaſed part, but to ſave the integuments, muſcles, nerves, and blood-veſſels, ſo that a ſufficient quantity of callous matter may grow up to ſupply the place of bone, and the patient at laſt recover the uſe of his limb. The probability of ſucceſs in this operation ariſes from the many inſtances there are of large pieces of bone having been naturally thrown out, and afterwards ſupplied with callus ſo well that the patient has never felt any inconvenience; of which ſome inſtances have already been given. There are likewiſe many examples of large portions of the ends of fractured bones being removed, when protruding through the wound, and the patient recovering very perfectly. But, though ſuch facts afford us very ſtrong analogical arguments in favour of the operation, there are nevertheleſs very ſtrong objections to it. 1. When the diſeaſed ſtate of the joint and ends of the bones, as well as integuments, is ſo great as to require amputation, the patient has generally ſuffered ſo much already, that nature is unable to exert thoſe vigorous efforts which ſhe will do in a ſound habit of body. 2. It is impoſſible we can ſucceed in renovating the ends of both bones in a diſeaſed joint, if they happen both to be infected; for the new joint would have nothing upon which it could form itſelf.

3.

3. From the very large ſize of the wound, as well as from the injury done to the muſcles and integuments, particularly in white ſwellings of the joint, we have little or no proſpect of recovering the patient; eſpecially when we conſider the great degree of injury done to the ſoft parts by the ſaw; particularly in ſwellings of the joints. 4. From the impoſſibility, in the uſual mode of placing the limb, that there can be an equal diſtance kept between the leg and thigh during the cure; even from the mere retraction of the muſcles, though we ſhould keep the limb ever ſo ſtill. 5. From the extreme danger there is of receptacles for matter being formed in various parts of the integuments, the quantity of which muſt undoubtedly deſtroy the patient, already exhauſted beyond meaſure by the diſeaſe he has ſo long laboured under. 6. Even the inflammation, which muſt neceſſarily take place in ſuch a large wound, muſt undoubtedly be very great, and not eaſily kept under. Theſe conſiderations, at leaſt moſt of them, however, do not ſo much militate againſt this operation, where the ends of the bones are deſtroyed by external injury. Here, undoubtedly, it may be performed with ſucceſs; and, in the hands of a ſteady and judicious practitioner, who can execute it with deſpatch, the patient may comparatively ſuffer but little.

Were

Were the machine recommended for compound fractures, and repreſented Pl. 2. Fig. 1. adapted to the thigh and leg from the haunch to the ancle, it would moſt probably anſwer the purpoſe better than any other that has yet been propoſed. The ſteel ſplints ſhould be made ſomewhat thick on account of their length; and by applying two immediately on the back part of the thigh, in contact with the ham, to the circular belt applied round the ancle, and one or two, if neceſſary, on each ſide, the retraction of the muſcles would be effectually reſiſted; while it is conſtantly in our power to have acceſs to the wound in order to dreſs it.

## SECTION X.

*CASES ILLUSTRATIVE OF THE FORMER DOCTRINES.*

I. J. M. aged thirty-ſix, after a ſevere cold, was ſeized with a violent pain in the joint of the right knee, attended with ſwelling and inflammation. The diſeaſe went on for nine months, at the end of which I was called. I found him very much emaciated, pulſe quick, and the anterior part of the joint ſurrounded by

by a large collection of matter. On ſtretching out the knee, and placing one hand upon the patella, and the other immediately behind the ham, the fluctuation of this matter was found very diſtinct. From the miſerable condition he was in, I concluded, as well as ſeveral others of my brethren, that there was no chance of ſaving his life but by amputation, and that the ſooner his limb was taken off ſo much the better. The operation being reſolved on, I began with preparing every thing neceſſary, a precaution always to be attended to by ſurgeons, that there may be no delay nor confuſion in their operations. The articles prepared were, 1. The adheſive plaſters, with the tapes for tying the ſides of the wound together. 2. The flannel roller for preventing the retraction of the teguments as well as keeping on the pledget of Goulard's cerate. 3. The pledget itſelf very large, and ſpread very thick with the ointment. 4. The cuſhion of fine tow to cover the end of the ſtump. 5. A compreſs of fine linen to lay over all, with a ſlip of linen three inches broad, and ten inches long, to lay acroſs the thigh from ſide to ſide. Things being thus prepared, the tourniquet was applied near the groin, and the ſkin drawn up by an aſſiſtant; after which, the circular inciſion was made at once through the integuments and cellular ſubſtance, which were then diſſected from the muſcles for about two inches, and held back

back by the aſſiſtant. The knife was then applied a ſecond time, with its edge ſlenting upwards, to the muſcles immediately at the under edge of the ſkin. Thus the firſt layer of muſcles were divided, and allowed to retract, and aſſiſted by the aſſiſtant; after which, the knife was applied in the ſame manner as before, and the under layer divided to the bone. This being completed, the muſcles adhering to the bone were diſſected away with the ſcalpel, for an inch upwards; the metal retractors were then applied, and the whole of the muſcles and teguments retracted as far as ſeparated from the bone. A circular inciſion was now made through the perioſteum round the bone; after which, the bone was divided as formerly directed, and ſuch points as remained were taken off by the nippers. The veſſels were taken up by the tenaculum, and the wound waſhed clean from clotted blood, and the ſides of the ſtump brought together; the whole of the end and ſides being wiped clean with a warm dry towel for the purpoſe, that no moiſture might remain ſufficient to prevent the adheſive plaſters from ſticking to the ſkin. The plaſter was then applied to each ſide of the ſtump as directed; and the roller being applied round the lower part of the body, in order to prevent it from ſhifting, it was applied circularly round the whole thigh as has been directed. When near the ends of the

ſtump,

ſtump, the edges of the wounds were neatly brought together, and kept there by the aſſiſtant. The tapes were tied on the point of the ſtump as already directed; every end of a ligature taken out directly oppoſite to the veſſel to which it belonged, and the pledget and dreſſings were applied as already mentioned. The patient was then put to bed, had an anodyne draught, with thirty-five drops of laudanum, and was ordered a glaſs of port wine every ſixth hour, to be given in a little breadberry. The following is a journal of the cure.

*1ſt Day after the operation.* Had ſlept ſeveral hours, pulſe about 100; had neither pain in the ſtump nor any bloody diſcharge from it, but a ſerous diſcharge appeared on the under part of the dreſſings. Wine, breadbery, and anodyne draught continued; had alſo a ſmall bowl of chicken broth in the middle of the day.

*2d Day.* Had a good night; ſtump continues eaſy without any ſtarting, but feels a little tenſion in it. Wine agrees with him. Pulſe as yeſterday. Wine and chicken broth continued, had his draught at bedtime; and, having been coſtive for three days, an injection was ordered.

*3d Day.* The injection had operated twice, with great relief of the heat and tenſion in the ſtump; had a good night, pulſe ninety. Appetite rather mending. Was allowed half a chicken

ken done on the gridiron, beſides his chicken broth. Draught and wine as before.

*4th Day.* Better in every reſpect. Dreſſings this day removed, when the ſides of the wound appeared in perfect contact, with little or no fulneſs at the end of the ſtump. The pledget and dreſſings were applied as before.

*6th Day.* Dreſſings again removed. Stump looks well, without ſwelling or inflammation, and with very little tenſion. Draught omitted, but the ſame regimen continued, and this night the injection was repeated.

*8th Day.* Stump looks well. Edges of the wound ſeem every where to adhere, except at thoſe places where the four ligatures of the arteries come out. Three of theſe ligatures came away to day, that on the femoral artery only remaining. A ſmall adheſive ſtrap was put over each opening of the ligature, after having preſſed the ſides of the wound together. Health evidently better, and ſtrength increaſing. Allowed a beef ſtake every day for dinner, and a glaſs and half of port, beſides the glaſſes in his breadberry as before. Pulſe eighty-four.

*12th Day.* The ligature of the femoral artery came away. Edges of the wound adhere throughout, and only a very ſmall diſcharge of matter from the ſinus formed by the ligature of the large artery. The roller was this day removed,

and freſh adheſive ſtraps applied, as the old ones were beginning to loſe their hold. The roller alſo put on again, and the tapes tied pretty firm to ſupport the parts. Health and ſtrength ſurpriſingly reſtored. From this day the dreſſings were renewed every twenty-four hours, and he was allowed to eat and drink more freely than before. Had three glaſſes of wine after dinner, and an Engliſh pint of porter with toaſt for ſupper, which he preferred to wine and breadberry.

16*th Day.* All the dreſſings again renewed. Edges of the wound adhered firmly, and reſembled the cicatrix of a hare lip. Nothing but the bandage was now applied to prevent too great a retraction. The end of the ſtump was dreſſed with ſeveral folds of dry caddice and a compreſs. He had been twice out of bed, and was now allowed to ſit up at pleaſure.

20*th Day.* The ſtump appeared ſound and firm, and he could bear it to be handled without any uneaſineſs. From this moment we all pronounced him well. The bandage and dreſſings, however, were continued a few days longer; after which, he began to walk upon crutches, until his ſtump ſhould be firm enough to bear the uſe of a leg. Pl. 4. Fig. 1. ſhows the end of the ſtump appearing as it is juſt now, at the diſtance of twelve years from the operation.

W. R.

II. W. R. twenty-two years of age, had got a violent ſprain in his right knee, which, notwithſtanding all the remedies that had been uſed by the ſurgeons to whom he applied, he ſtill continued to grow worſe and worſe. I ſaw him when the diſeaſe had continued fifteen months, having been previouſly conſulted about his caſe by letter. By this time a collection of matter had been formed in the knee joint, and the fluctuation was very perceptible. The motion of the joint, which had from the firſt been impaired, was now totally deſtroyed, and the pain was quite intolerable, eſpecially in the night time. As the matter ſeemed to point on the outſide of the knee joint, near the head of the tibia, it was judged proper to give it vent, by an opening with an abſceſs lancet. A very ſmall quantity of matter was diſcharged; after which, a poultice of bread and milk was applied over the wound, to promote the ſuppuration, if poſſible; but, in two days after the opening was made, the pain became quite intolerable, the pulſe 120, with head-ach, thirſt, reſtleſſneſs, and other ſymptoms of fever; the matter alſo became ſo acrid, that the integuments became excoriated by it as it paſſed over them. Amputation above the knee was now propoſed as the only thing that could give a chance of relief, or of ſaving the patient's life. To this he immediately

diately conſented, and the operation was performed exactly as in the former caſe. After the bone was ſawed, I took up the principal branch of the femoral artery, and two other conſiderable muſcular ones. Before the application of the adheſive plaſters, I took care to waſh the ſtump and thigh carefully; for, unleſs this be done, they will not ſtick, neither will they do ſo if the ſkin be not very well dried after it has been waſhed. The dreſſings were applied exactly according to the directions formerly given; after which, he was laid to bed, and had an anodyne draught with forty drops of laudanum, and at bed time had another with an equal quantity. To take off the feveriſh heat he had eight ounces of ſaline jalap, with two ounces ſpiritus mindereri, an ounce to be taken every hour till a free perſpiration come on. There was no bloody diſcharge, but a conſiderable ſerous, one upon the ſheet of the bed and under part of the dreſſings. He quickly recovered from the miſerable ſituation he had been in before amputation. On the fourth day the febrile ſymptoms were almoſt entirely gone, the dreſſings were removed, and the wound apparently united. On the ſeventh day all the ligatures came away, and on the 12th he had no complaint but weakneſs. On the 16th the ſtraps were removed, and the end of the ſtump covered

covered with old linen and a flannel cap. In four days more he was able to rife out of bed, and in a fhort time to walk with crutches. He has fince continued well for ten years, the time his leg was amputated.

III. M. A. thirty-two years of age, had a large fluctuating fwelling on the right knee joint, attended with violent pain, inflammation, and fwelling; the collection of matter having evidently paffed through the whole joint, as it was felt to fluctuate both before and behind; the limb was much wafted, his pulfe 106, and his appetite greatly impaired, as well as his ftrength, fo that it was evident that nothing could fave him but the lofs of his limb. I performed the operation as near the knee joint as poffible, without including any of the difeafed integuments. He was treated in every refpect as the two preceding patients, and the fuccefs was equal to either. The only thing in which this cafe differed from the others, was the too great tightnefs of the bandage, which occafioned fome uneafinefs and fwelling, but no inflammation. It was effectually relieved by loofening the bandage and tapes, and tying them flacker. Here I fhall take notice, once for all, that when a bandage is unloofed in cafes of this kind, we muft cauſe an aſſiſtant cautiouſly raiſe and fupport

port the thigh during the whole time of the dreſſing. On the 12th day ſeveral medical practitioners were preſent at the inſpection of the ſtump, when, to their aſtoniſhment, they ſaw that the wound was completely united throughout its whole length; even the edges of the ſkin being united as well as the fleſh. On the 16th it was perfectly ſound, only a little tender to the touch. The dreſſings were removed, and ſome fine dry linen and a flannel cap, as in the former caſe. He was now allowed to take his uſual food; and, from that day to the preſent time, which is near ten years, has had no complaint, except before very great and ſudden changes of weather, when he feels ſome ſhooting pains; which, however, ſoon go off. In this caſe the inflammation was very ſucceſsfully kept under, by the ſolution of lead.

IV. M. W. twenty-five years of age, had laboured under a white ſwelling of the right knee, for upwards of fourteen months, apparently brought on by cold and ſevere fatigue, and which had reſiſted every medicine that could be thought of. When I ſaw him, the limb was much waſted both above and below the joint, with moſt ſevere pain, and emaciation of the whole body. Amputation being plainly the only chance he had for life, I performed the operation

operation exactly in the same manner as has been already described. The stump was dressed in the same way, and his treatment in other respects exactly alike. He was kept open in the belly for the first eight days, by injections of infusion of sena, given every second night; having an anodyne draught only for the first six nights. The ligatures were all thrown out on the eighth day, and no discharge took place, excepting a very little for the first twenty-four hours. In twelve days after the operation, the sides of the wound seemed to adhere together very firmly; nevertheless, the plasters and bandages were kept on till the eighteenth day, when the cure appeared to be quite completed. He left me on the twenty-fourth day, and has continued well ever since.

V. P. A. aged eighteen, had a large irregular tumor near the head of the tibia, and extending downwards to about four inches above the ancle, almost surrounding the whole upper part of the leg immediately below the joint of the knee. The colour was livid, and collections of matter seemed to be formed in many places. The pain was always great, but became intolerable upon any attempt to move his body; neither could he support himself upon it in the least. When he attempted to do so, something

ſomething ſeemed to yield in the centre of the tumor, attended with the moſt acute pain. The complaint had been of ſix years ſtanding; and began, as he thinks, with a ſmall, round, and moveable tumor, immediately on the inſide and upper part of the tibia below the joint. It was not painful for a long time after its firſt appearance, though it gradually enlarged, and became more fixed; but, about two years before I ſaw him, it began to be painful, and to increaſe in ſize very quickly, ſpreading in every direction, and became exceſſively ſore when touched. In ſix months more, he could ſcarce lay any weight at all upon it, and was obliged to uſe a crutch. On examining the part, I found the whole anterior and ſuperior part of the tibia diſſolved, ſo that I could eaſily bend the limb below the knee joint, but not without increaſing the pain to an extreme degree; and he told me, that the ſenſation he felt on my attempt to bend the leg, was ſimilar to that which he felt on attempting to uſe it. As this plainly ſhowed, that the bones as well as the muſcles were irretrievably gone, there was no alternative left; and this clearly points out one of thoſe caſes, where, though the diſeaſe is ſituated below the knee, we are obliged to amputate above it. Many different practitioners had been conſulted four years before I ſaw him, when, though very large, yet it was quite

quite moveable; but, on the moſt minute inquiry, I could not find that any thing had been ordered but ſome unctuous applications, and ſea bathing. Had it, at this time, however, been removed by the ſcalpel, which ſeems to have been then the only proper method, it would have ſaved the poor patient a great deal of the moſt exquiſite diſtreſs, and poſſibly alſo his limb. Amputation was now reſolved on, and performed according to the directions already given. The treatment was ſo exactly ſimilar to thoſe already deſcribed, that it is needleſs to deſcribe it particularly. On the fifteenth day the dreſſings were taken off from the wound, and linen and flannel applied as uſual. On the twenty-fourth he left me perfectly cured, and greatly recovered in health. On diſſecting the amputated limb, I found the bones and muſcles in the upper part where the tumor was entirely diſſolved into a black and grumous maſs.

VI. J. B. twenty-eight years of age, had a large, painful, and colourleſs ſwelling of his right knee, occupying the whole joint. The ſwelling was elaſtic to the feel, and very painful when touched. The pain was indeed conſtant, and extreme; ſo that, for ſeveral weeks, he had not known what it was to ſleep an hour at a

time. He was much emaciated, and the limb and thigh of the affected ſide very much waſted. A conſiderable collection of matter had been formed in the fore-part of the joint, which was eaſily made to paſs through, as well as all round it in the inſide; but, though he was in great diſtreſs, no hectic ſymptom had as yet made its appearance, ſo that he had yet a chance of ſaving his life by amputation. The operation was performed in the uſual manner; three arteries were ſecured, and the ſtump, after being carefully cleaned from the clotted blood, was dreſſed and ſecured as has been already directed. He had an anodyne of thirty-five drops of laudanum on being put to bed, and the ſame repeated at night; nevertheleſs, he ſlept little or none, although there was no complaint of pain from the ſtump. As his ſkin was ſomewhat hot and dry, he had a diaphoretic mixture to bring on perſpiration. He was ordered apple-tea for his drink, and food of the lighteſt kind. Next night the unfavourable ſymptoms were gone; he had ſlept ſome hours, and a gentle perſpiration came on, without any pain or uneaſineſs in the ſtump. The draught was repeated at bed-time with good effect; only, next day he complained of a little tightneſs in the ſtump; had not made his water ſo freely as uſual, and had much wind in his bowels. He was ordered an

electuary

electuary of an ounce of cryſtals of tartar, a drachm of compound powder of jalap, and ten grains of powdered ginger made up with ſyrup; a tea ſpoonful to be given every half hour, until it operated. By this he was relieved, the electuary had operated both by urine and ſtool, the dreſſings were this day removed, and the ſtump looked well, the edges in perfect contact, with only a ſmall quantity of ſerous diſcharge from each ligature. As the danger of inflammation and any febrile ſymptom decreaſed, he was allowed a more generous diet to recruit his ſtrength; a rule never to be forgot in ſuch caſes. From this day the cure went on proſperouſly; on the tenth the ligatures came away; on the fourteenth the ſtump ſeemed perfectly ſound; and, on the twenty-fourth, he was diſmiſſed completely reſtored to health, and has continued ſo for nine years.

VII. M. R. thirty-two years of age, had his right leg ſhattered to pieces juſt below the knee, by a loaded cart paſſing over it. All the muſcles were torn and deſtroyed in ſuch a manner that there was not the moſt diſtant proſpect of a cure, and therefore amputation was inſtantly performed above the knee in the manner already directed. There were only two veſſels to be ſecured; after which, the dreſſings were applied

applied as usual, and the patient being put to bed, had an anodyne draught with forty drops of laudanum, with another to be taken, if necessary, at bed-time. He had but an indifferent night; complained next day of headach, thirst, and heat all over him, particularly in the stump and thigh, where also he felt a good deal of tightness. As he made no complaint at first of the bandage having been too tight, it was evident that the symptoms which had now ensued were the consequences of swelling in the limb itself, from a tendency to inflammation by reason of the fulness. As he was a stout young man, therefore, and had lost very little blood, either by the accident or operation, I took sixteen ounces of blood from his arm, gave him a diaphoretic mixture, undid the bandage, and tied it a little slacker. Towards afternoon his complaints were all much easier, and he had a gentle perspiration; but next day, as he still complained of heat and uneasiness in the stump, and had had a restless night, I took away twelve ounces more of blood, unloosed the bandage, and took away the dressings. I found the stump considerably swelled, and very tense, but without any appearance of inflammation. Two folds of flannel, moistened in solution of sugar of lead, were applied all over the stump, the assistant and nurse being desired to moisten the flannel with

with the folution very frequently. In the morning he was directed to take a tea ſpoonful of the laxative and diuretic electuary, without ginger, every two hours, until it operated. His food was panada, and his drink water gruel, acidulated with lemon juice; the draught was omitted. By theſe he found himſelf conſiderably relieved, the ſtump was ſomething leſs, though ſtill very tenſe. The cold applications were continued till the eighth day, when they were laid aſide for the ordinary dreſſings. On the 12th the wound appeared to be completely united, but the dreſſings were ſtill continued, to prevent any retraction that might happen. On the 20th day he went to the country, with great eaſe, in a carriage, and has continued well ever ſince. This caſe ſhows evidently the benefit of the moſt antiphlogiſtic regimen in young and plethoric patients; and it likewiſe ſeems deciſive in favour of immediate amputation where the limbs have received ſuch external injury as renders them entirely beyond hopes of cure. Here the patient recovered fully as well, and as ſoon as the others, who were much more exhauſted; indeed ſo much, that, when the operation was about to be performed, they looked more like living ſkeletons than any thing elſe.

W. R.

VIII. W. R. thirty-four years of age, had a large tranſparent ſwelling round the left knee joint, attended with pain, loſs of motion, and waſting of the limb, both above and below, want of reſt, and a great decay of health and ſtrength. His appetite was much impaired, his belly at times very looſe, but what was diſcharged had no ſtrong ſmell, nor had he any gripes about the navel; which laſt ſymptoms I have obſerved are a never failing ſign of the abſorption of purulent matter into the ſyſtem, and paſſing off by ſtool. The complaints had originally proceeded from a ſtrain, which being neglected, or improperly treated, they ſeem to have ended in a white ſwelling. From the ſituation of the patient, it was evident to me, as well as to ſeveral other ſurgeons who had ſeen him, that amputation was the only remedy, and I inſtantly performed it, according to the directions already given. The cure went on very proſperouſly without any unfavourable ſymptom, excepting a ſlight degree of tenſion, which was eaſily removed by the electuary of cream of tartar and jalap. On the 18th day the ſtump ſeemed quite ſound; and on the 25th he ſet off in the ſtage coach for Glaſgow, a journey of forty-four miles to be performed in one day. Had I known of this journey I certainly would have objected to it, but it was done without my knowledge

knowledge or conſent; and I did not hear that he was materially injured by it; and he ſtill continues well, eight years after the operation.

IX. A. B. twenty-ſeven years of age, had the misfortune to twiſt his knee by leaping over a wall. By the application of leeches, and promoting a free diſcharge from them, the pain ſoon abated; but, being a young man, and a keen ſportſman, he went abroad too ſoon, and this quickly renewed his complaints. For ſome time he concealed his diſtreſs; but being obliged at laſt to make it known, recourſe was again had to the leeches, which, by repeated applications, did indeed abate the pain, but the ſwelling did not diminiſh in the ſame proportion. As he ſtill continued to exerciſe himſelf whenever he obtained the leaſt relief, he accidentally hurt the ſame knee afreſh. The leeches were then tried a third time, but failed in affording the ſame relief as before; on which he had recourſe to all the abſurd remedies recommended by old women as cures for ſtrains and hurts in the joints. Of theſe the application of the warm *web*, or epiploon of a ſheep, is one; and this he perſiſted in for a long time, but without the ſmalleſt relief. The ſhooting pains through the joint continually increaſed, as did alſo the ſwelling; he was confined to bed for three months, and

and at laſt was unable to bear the leaſt motion of the joint, and the limb waſted both above and below the joint. In this ſituation I ſaw him, ſixteen months after the accident. On examining the tumor, I found evidently a collection of matter which paſſed through the body of the joint, ſo that, having conſulted with a phyſician upon the caſe, we both agreed that amputation was abſolutely neceſſary to ſave the patient from death. This being agreed to by the patient, the operation was performed in the manner already directed. Five arteries were taken up by the tenaculum, and very little blood was loſt. The cure went on ſucceſsfully without any ſiniſter accident. On the 12th day the edges of the wound ſeemed perfectly united; but the ſtraps were not removed till the 16th, on account of a ſmall ſeparation having taken place in the centre of the cut. This required the attentive application of the two ſtraps next to it for five or ſix days longer; and on the 24th he walked through his room in preſence of his phyſician and myſelf, to ſhew us how he could uſe his crutches. During the whole of the cure he never had any ſtarting of the ſtump, nor any pain, excepting now and then a little uneaſineſs and pricking ſenſation in the extremities of the nerves, and which he ſaid he felt as in his toes.

X. W. T. aged twenty-ſix, had a large colourleſs ſwelling on the joint of the left knee, attended with ſhooting pain, loſs of motion, and other ſymptoms peculiar to ſuch tumors. Symptoms of abſortion had alſo taken place, as occaſional looſeneſs without gripes; but, though there was evidently a collection of matter in the fore part of the tumor, it did not ſeem to have penetrated the cavity of the joint. It was therefore judged proper by the practitioners who ſaw this patient to try what might be done by evacuating this fluid, by an opening with an abſceſs lancet. This was accordingly done, a quantity of matter was evacuated, with conſiderable relief; and, for a ſhort time, the patient flattered himſelf with the hope of ſome permanent benefit. But, though the operation had been performed on a ſuppoſition that the matter had not penetrated the cavity of the joint, and every care had been taken to exclude the air, by not allowing the matter to diſcharge itſelf fully, and likewiſe by covering up the orifice as cloſe as poſſible with a pledget ſpread with mild ointment, yet the event ſoon ſhowed that there was a communication between that cavity and the external air. A violent inflammation came on in two days after the operation. The pain, which had always been too violent to allow him almoſt any ſleep, became intolerably

ſevere; he was attacked by febrile ſymptoms, the pulſe roſe to 120 in a minute, the wound threw out funguſes extremely painful, and diſcharged a dark coloured ichorous matter. Theſe ſymptoms continued to increaſe, until at laſt the pulſe roſe to 130, when it was evident that now there was no time to loſe, and that the poor patient would moſt certainly expire, if amputation was not very ſoon performed. The limb was therefore taken off as near the affected joint as poſſible; and, notwithſtanding the very miſerable ſituation in which this patient was before the operation, the cure went on afterwards ſurpriſingly well. The veſſels to be taken up were only two in number; but, in this caſe, in order to exclude more effectually the air from the ſurface of the wound, I faſtened the parts to one another, not only by adheſive ſtraps, but by the twiſted ſuture, introducing ſeven gold pins, and putting the thread round them only thrice, that, in caſe there ſhould be any occaſion for unlooſing them, I might do it with more eaſe than if it had been put round more frequently. The febrile ſymptoms were quickly got the better of by gentle diaphoretics, and mild purgatives, while any local inflammation in the ſtump was effectually prevented by ſaturnine applications. On the ſeventh day the ligatures came away; and on the ninth the gold pins were removed,

and

and the ſides of the wound were found to adhere together, but ſtill ſomewhat inflamed and painful. The dreſſings with Goulard's ointment were continued, and two adheſive ſtraps of the uſual length were applied acroſs the middle of the ſtump, oppoſite to the cut end of the bone, in order to prevent the newly formed cicatrix from being injured by the too great retraction of the muſcles. On the 12th day the pain and inflammation were almoſt entirely gone, and the wound ſeemingly coaleſced, but the dreſſings were kept on for ſome days longer. On the 20th he appeared in good health, but extremely weak; and on the 24th his health appeared to be confirmed, and his ſtrength returning. On laying open the knee joint of the amputated limb, a conſiderable quantity of the ſame diſcoloured matter, which had been uſually diſcharged by the wound, was found in it; the cartilages on the ends of the bones were much diſcoloured, and in ſome places corroded.

XI. D. S. twenty-ſix years of age, had a ſwelling ſimilar to the former, with a collection of matter on the outſide of the joint; but, as in the former caſe, an attempt was made to relieve the patient by a diſcharge of the matter, in the ſuppoſition that it had not penetrated the cavity of the joint; ſo in this, from a ſimi-

larity

larity of circumſtances, the ſame attempt was made. The ſucceſs in both was very much alike. In a week after the opening was made, the fever had riſen ſo high that the patient's pulſe beat upwards of 140 in a minute; yet, notwithſtanding the exceſſive height at which the bad ſymptoms had arrived, amputation was performed with the greateſt ſucceſs, and the cure went on as though nothing had happened, only the patient was reduced to a weaker ſtate than in all probability he would have been in, had no attempt been made to relieve him without amputation. The parts were, as in the former caſe, ſecured by the twiſted future, as well as by adheſive ſtraps; no inflammation followed the inſertion of the pins any more than if the dry future only had been uſed. The ends of the bones were here found corroded as in the former caſe. Both theſe patients were operated upon in public, and attended in public. The hiſtories of their caſes ſhow not only the excellency of the method of operating and dreſſing the wound above recommended, but they alſo ſhow the futility of any attempt to cure a joint, the cavity of which contains matter, by evacuating that matter, as it is utterly impoſſible to prevent the air from having acceſs to the cavity, and exciting the moſt violent and fatal ſymptoms.

W. R.

XII. W. R. aged twenty-one, had a violent ſprain in his right knee about two years ago, which, in ſpite of every remedy, gradually became more and more painful, with ſwelling and inflammation, until the joint became at laſt totally immoveable; and he was reduced to a ſituation ſimilar to the former patients, his leg and thigh much ſhrunk, his health impaired, and himſelf evidently reduced to a dying condition. Amputation was inſtantly performed with very little loſs of blood, and four veſſels were tied up. The ſides of the wound were kept in contact by the interrupted future. Six broad flat threads, well waxed, were introduced by as many needles of a proper ſize; after which, the edges of the wound were brought cloſe together by an aſſiſtant, and a running knot tied over them by the ſurgeon. The ligatures were brought out at their proper places, and the whole dreſſed as uſual.

Here I had an opportunity of comparing the mode of uniting the parts by the interrupted future, with thoſe of the dry and twiſted futures. In the preſent caſe, I found that ſome degree of inflammation was produced by the interrupted futures, and conſequently that the other modes of union are to be preferred. The following is a particular hiſtory of the cure:

*1ſt Day after the operation.* Had a good night; little pain, but complains of heat in the ſtump. Pulſe ninety. Tongue clean. Breadberry and wine for breakfaſt, chicken or veal broth for dinner, and rice and milk for ſupper.

*2d Day.* Stump uneaſy, painful, and tenſe, ſo that it became neceſſary to remove the dreſſings. The end of the ſtump then was obſerved to be conſiderably ſwelled, and a redneſs was perceptible at every ſtitch. The parts between the ſutures protruded a good deal, for which reaſon I untied every one of them, tying them more ſlackly afterwards. The end of the ſtump was then covered with a large pledget of Goulard's cerate thickly ſpread. This pledget to be removed twice a-day. An anodyne at night as uſual.

*4th Day.* Appearances much the ſame. No increaſe of the ſwelling or inflammation. Ordered an injection of plain water and oil. Draught continued.

*6th Day.* Stump ſtill a little ſwelled and inflamed, eſpecially alongſt the edges where the ſutures are introduced; but the parts ſeem to adhere together, and no matter is formed. Dreſſed morning and evening with Goulard's ointment. Draught and injection to be repeated at night.

*8th*

8*th day.* Some degree of ſwelling yet remains, with inflammation at the ſutures. Very tender on being touched or handled. To be covered with two or three folds of flannel, moiſtened in ſolution of ſugar of lead, three or four times a-day. Injection and draught at night as uſual.

10*th day.* Swelling and inflammation greatly diminiſhed. Pulſe, appetite, and ſtrength daily growing better; all the ligatures thrown out, the laſt of them two days ago.

12*th day.* Inflammation gone, and ſwelling ſtill diminiſhing. All the ligatures of the ſutures taken away; the openings, through which they paſſed, are pretty large.

18*th day.* All theſe openings filled up. Stump dreſſed with dry linen and flannel.

26*th day.* Diſmiſſed in perfect health.

XIII. R. J. aged nineteen, had a very large ulcer ſurrounding the whole upper part of the leg, diſcharging a vaſt quantity of matter, and by which both tibia and fibula have been laid bare, and become carious for a conſiderable way. This terrible ulcer firſt originated from a ſcald with boiling water, after which he was ſeized with a nervous fever, when the burn ſpread and became gangrenous. The mortified parts had ſeparated ſome time before I ſaw him; but from the quantity of matter diſcharged, and the

the ſtate to which the patient was reduced by it, together with the bad condition of the ulcer itſelf, it was judged proper to amputate the leg before any hectic ſymptoms ſhould take place. I performed the operation in the uſual place and manner, ſecuring the parts by adheſive plaſters; but the event proved unfortunate. At the time the operation was performed, his pulſe was very quick and feeble, ſo that it became neceſſary to ſupport him with a glaſs of Port wine now and then, beſides an anodyne draught with forty drops of laudanum after the operation. Next day his pulſe was at 100, the ſecond day at 112; on the fourth it had again fallen to 100, but he was diſtreſſed with cough, and complained of a foreneſs all over the body. He had an anodyne and pectoral mixture, a table ſpoonful to be ſwallowed when troubled with the cough. Next day the ſtump was dreſſed for the firſt time, and looked well; but the cough continued very ſevere, and on the eighth day the expectoration became purulent; on the 16th it was ſo copious that he expectorated two pounds and an half of purulent matter in twenty-four hours. Hectic ſweats now came on, the ſtump began to look ill, a great diſcharge of matter came from it, and he died on the twenty-firſt day after the operation.

In this patient it is obvious that the diſeaſe had gone too far before the amputation was performed, though there were not any ſigns by which it could have been diſtinctly known. It is, however, worth while to inquire whence came this ſudden and exceſſive diſcharge of pus from the lungs, immediately after the leg was amputated, and which ſeemed evidently to be brought on by the operation. The patient had no ſymptom of hectic before the operation; he had no cough; ſo that we cannot ſuppoſe the lungs to have been diſeaſed. As no ſuppuration took place in the wound, it is impoſſible that any pus could have been abſorbed from it. As, therefore, it neither exiſted in the body previous to the operation, nor was formed in the wound; it muſt, of neceſſity, have been formed in the ſyſtem at large. If this was the caſe, which, in the preſent inſtance I do not ſee how we can well deny, it leads to a ſuſpicion that what we uſually call the *abſorption* of pus, is really a formation and diſcharge of it. In diſeaſed and debilitated bodies, then, may we not ſuppoſe, that what we call an hectic, may ariſe originally from a kind of inflammation and ſuppuration of the blood itſelf; and, that, if left to nature, it commonly diſcharges itſelf upon the lungs; while, in caſes like the preſent, where there was an opportunity of a large ulcer, it

took a turn that way; but, on being ſtopped by the amputation, and the wound healed by the firſt intention, it was reflected back upon the lungs. In this caſe, it ſeems plain that the ulcer was a drain to ſome matter in the body; which, if confined in it, would prove fatal; and this again leads to an enquiry, whether, in caſes where amputation is required by extenſive ulcers, it would not be more proper to heal the ſtump by ſuppuration than by the firſt intention. It would be ſuperfluous to give more caſes ſimilar to thoſe above related. The hiſtories I have given are abundantly ſufficient to ſhow that the cure may be performed in various ways; viz. either by adheſive ſtraps, by the twiſted, or by the interrupted ſutures. I ſhall, however, relate a few more of very bad compound fractures, where the propriety of immediate amputation is ſhown, in order to ſave the patient's life.

XIV. A. P. twenty-five years of age, had the right leg fractured, immediately below the head of the tibia, by the wheel of a heavy loaded cart. The bones were completely cruſhed into ſmall fragments for four inches, and the muſcles of the limb ſo injured by the preſſure, that they were almoſt divided. The limb was immediately amputated above the knee as directed,

ted, and the edges of the wound retained in contact by the twiſted ſuture. A pledget of emollient ointment was laid over the wound, and a roller applied as directed upon the thigh. After being put to bed, he had an anodyne draught with forty drops of laudanum. Febrile ſymptoms, with pain and heat in the ſtump, began to come on the day after the operation; for which he was blooded in the arm to twelve ounces, and had a large water injection. By theſe he was conſiderably relieved; but, as the tenſion ſtill continued, the bandage was ſomewhat ſlackened; but as this ſtill did not prove effectual, recourſe was had to leeches. Twenty-four of theſe were applied to the ſtump, and a copious diſcharge promoted by the application of dry warm linen cloths. After the blood ſtopped, cloths dipped in warm ſolution of lead, were next applied. By theſe the ſymptoms were greatly abated, but ſtill they did not yield entirely without a ſecond application of the leeches, and a conſtant uſe of the ſaturnine fomentations. On the 7th day two of the ligatures came away, and all the reſt on the 9th. On the 12th the pins were removed, and on the 18th the patient had no complaint but weakneſs.

M.

XV. M. R. aged twenty-three, by an accident of his horſes running away and overturning a cart upon him, had his left leg broken, and the ſkin and muſcles ſtripped off. He had loſt a great quantity of blood before I ſaw him, and the injury being ſo great, that even the capſular ligament was torn, I loſt no time in performing the operation. The edges of the wound were united by the interrupted future, and the dreſſings and roller applied as already directed. After being put to bed, and getting an anodyne draught of thirty drops of laudanum, there was neither hæmorrhage nor ſtarting of the limb; but, next day, the inflammatory ſymptoms came on, and required copious blood-letting by leeches, as well as evacuation by ſtool, to counteract them; however, the patient did well, and his ſtump was united, and healed on the 16th day from the operation, and has continued well ever ſince.

XVI. D. S. a ſtrong healthy man of twenty-five years of age, had his left leg ſhattered to pieces below the knee, by a ſtone from a rock which he was blowing with powder, and all the muſcles of the calf were torn in a ſhocking manner; an hæmorrhage had taken place, which was ſtopped by tying a cord round the limb above the knee. The operation was performed

formed as ſoon as poſſible, in the uſual place, and the wound ſecured by the interrupted ſuture. The inflammatory ſymptoms came on as uſual, in patients where amputation is performed on a healthy body. Ten ounces of blood, however, were taken away, by way of prevention, which had a buffy covering. Notwithſtanding this, inflammatory and febrile ſymptoms did come on, which could not be removed but by copious topical bleeding by leeches, evacuations by purgatives, and the moſt cooling and antiphlogiſtic regimen. He was able to walk on crutches the 20th day after the operation, when the ſtump was perfectly healed.

XVII. R. M. twenty-four years of age, ſtrong and vigorous, had his left leg broke to pieces by a tree falling upon it, and cruſhing the leg between itſelf and a large branch of the ſame tree, which had been formerly ſeparated from its trunk. The limb was in a moſt ſhocking condition, not only bones being broken, but the muſcles alſo divided in ſuch a manner, that very little would have ſeparated the foot from the leg entirely; amputation was therefore performed as ſoon as poſſible. The ſides of the wound were brought into contact, and kept there by the interrupted ſuture, and dreſſed as directed. He had an anodyne draught as uſual,

uſual, and continued eaſy till the ſecond night after the operation, when he had a ſlight ſhivering fit, and complained of a headach. About eight o'clock the ſame evening, he complained of pain in his belly, about the navel; for which he had a large watery injection. This operated twice with ſome relief; but, as the pain increaſed very much about ten o'clock the ſame night, and his pulſe, which had formerly been contracted, became more ſo, I began to fear an enteritis, occaſioned by the great heat he had been in when he met with the accident, it being one of the hotteſt days we had that ſummer, (the thermometer ſtanding at 76), and his lying upon the ground two hours afterwards, before he was removed to any houſe; I therefore blooded him to ſixteen ounces, and he lay pretty quietly during that night.

Next morning the pain returned with great aggravation; another pound of blood was taken away, which likewiſe gave relief; after which a large bladder with water was applied to his belly. Both portions of blood had the thickeſt buffy coverings I ever ſaw. The pain continued eaſy till late in the afternoon of the ſame day, when it again recurred with great violence. A third pound of blood was taken away, and a large watery glyſter injected, which he retained ſeveral hours; and during this time the pain abated

abated greatly, but the pulſe ſtill continued near 100, and very full and hard. On the third morning the pain again came on with great violence, and I was once more obliged to have recourſe to the lancet. Twenty ounces of blood were taken away, and the bladders with warm water were again applied. The pain abated very much for the whole day, and his pulſe became much ſofter; but on the fourth, the pain returning with as great violence as before, I was obliged to have recourſe to the lancet a fifth time, and took away twenty ounces; applying afterwards a large bliſter to the whole abdomen. Next day the pain had almoſt totally gone off, the bliſter was well riſen, and the pulſe, now upwards of 100, was free and without contraction. On viewing the ſtump, the ſides of it appeared to be in perfect contact, and the edges beginning to adhere. In the afternoon he had two large watery gliſters, as the firſt did not operate. For theſe laſt four days his only food was milk with a little fine bread; his drink generally whey made from milk immediately from the cow; and as ſoon as the diſeaſe was diſtinctly marked, he had no anodyne draught. The pain of his belly never reached farther than ſix inches round the navel; and he had no ſickneſs, nauſea, or vomiting. Thus matters went on well till the eighth day, when, about two o'clock

in

in the morning, the ſtump became exceedingly painful, from the tightneſs, as he ſuppoſed, of the roller. It was unlooſed early in the morning, and the end of the ſtump found to be ſwelled, and very tenſe. His pulſe being now full and hard, and being now apprehenſive of ſuch an inflammation as might produce matter, I inſtantly applied warm fomentations of ſolution of ſugar of lead all round the under part of it, charging my aſſiſtant to ſee them renewed every two hours. Next day the ſwelling was almoſt totally gone, the day after the ligatures came away, and the cure thenceforth went on rapidly without any interruption, being perfectly completed in fifteen days. The great evacuations which this man had ſuſtained neceſſarily weakened him conſiderably; but, by proper care, his health and ſtrength returned. His ſtump with the wooden limb are repreſented Pl. 4. Fig. 2, 4.

From theſe caſes, it is moſt evident, that, in all patients where amputation is performed in conſequence of an external injury, particularly when the patient is young, there will be tendency, eſpecially if they have been previouſly very robuſt and vigorous, to inflammation, and an high degree of fever, which, if care is not taken to abate theſe ſymptoms, they will end in ſuppuration; but they may be eaſily conquered by proper care and attention in the beginning,

while, on the other hand, if allowed to proceed too far, ſuch grievous ſymptoms may ariſe as will baffle our utmoſt ſkill, which I am ſorry to ſay in ordinary practice too often happens. I ſhall now proceed to give an account of the ſucceſs of the ſame method of performing amputation in other parts of the body.

XVIII. A. L. aged eighteen, got a violent bruiſe on the hollow of his left foot, which at firſt produced an uneaſy ſenſation of heat there, and at laſt ſuch a ſevere pain that he could not reſt. A very perceptible ſwelling now began to take place. Saturnine poultices were then applied, but without effect; the ſwelling became gradually diſcoloured, red, and ſomewhat livid. A poultice of bread and milk was now applied; ſome time after which the tumor broke, and diſcharged a little purulent matter, which quickly degenerated into an ill conditioned brown ichor mixed with a kind of curdy particles. This was attended with no relief, any more than ſeveral other diſcharges of matter which took place from different parts of the foot. The diſeaſe went on for many months, until at laſt he applied to me. The whole foot was now much ſwelled, and of a livid colour, the ancle joint entirely deſtroyed, all the bones of the tarſus carious, the limb greatly waſted,

and his health very much impaired by the conſtant and exhauſting diſcharge, and want of reſt. At a conſultation of phyſicians and ſurgeons, it was determined to amputate the foot in order to ſave his life, and free him from the exquiſite torment he ſuffered. As he was a young man, it became an object with me to give him the uſe of his limb as much as poſſible, and therefore I waited upon the late Mr Gavin Wilſon, an ingenious machine maker and worker in leather, to know if he had ever conſidered the matter beyond the principles of his own trade, and whether, upon rational principles, he could inform me what length of ſtump would be found moſt uſeful after the foot was cut off. To this he made anſwer, that, when the leg was cut off immediately above the ancle, the ſtump paſſed ſo far down the boot, that it had liberty to move from ſide to ſide as the perſon walked; and thus the under end of it rubbed ſo ſtrongly upon the internal part of the machine that it gave incredible pain, and excoriated the parts. He alſo informed me that this had happened in ſeveral caſes, by which means the machine was rendered uſeleſs; but that, having been conſulted by another practitioner, ſince dead, upon the ſame ſubject, he gave it as his opinion that the bone ſhould never be cut lower than nine inches below the middle of the knee joint. Thus he thought

thought the friction would be taken away, and the perſon might uſe the machine with freedom, a flannel roller being wrapped round the ſtump in ſuch a manner as to fill the box of the machine, and fix the limb in it. The caſe ſucceeded to his wiſh, and the patient could uſe his artificial limb with great eaſe. I followed the ſame advice, and performed the operation in the following manner.

Having laid the patient on a table, compreſſed the artery, and applied the tourniquet, ſo as entirely to ſtop the circulation of the blood, which, by the bye, (I always take care to do myſelf), I cauſed one aſſiſtant hold the foot, and another the limb and tourniquet, a third ſtood by to give me the inſtruments, and one or two to aſſiſt the patient with drink or any other thing neceſſary during the operation. Having meaſured exactly nine inches from the middle of the knee joint downward upon the tibia, I marked it with a bit of chalk, which is perhaps preferable to ink, (as we muſt wait for ſome time till the ink dry), I cauſed an aſſiſtant pull up the ſkin forcibly, and then began my inciſion about three inches and an half lower down than the mark, making the heel of my knife follow my eye, and thus at once made a complete circle round the limb, dividing the integuments quite down to the muſcles. This being done, I diſſected away the ſkin and cellular

lar ſubſtance from the perioſteum on the fore part of the tibia, and from the tendons of the muſcles on the back part of the leg, for upwards of two inches and an half; after which, I divided the muſcles on the back and ſides of the leg to the bone at once, ſlenting upwards as much as poſſible. Having done this, I introduced the catiline between the tibia and fibula, and divided them there completely; after which I endeavoured to ſeparate them as completely as poſſible from the bones for about another inch. The piece of linen with three tails was then introduced between the bones, as formerly directed, the broadeſt part being to the back of the leg, by which means the aſſiſtant was eaſily enabled to retract the parts ſufficiently. Having then turned the patient a little to the oppoſite ſide, I divided both bones at once, ſtanding between his legs, and thus removed the diſeaſed part of the limb entirely. Three arteries were taken up by the tenaculum, the ſtump was cleared from clotted blood, and the parts were brought into contact and retained there, by means of the twiſted future, aſſiſted by adheſive ſtraps going acroſs the end of the ſtump, from ſide to ſide, between each of the gold pins. The wound was covered with a pledget of emollient ointment, over which was put a thin cuſhion of tow, and above that a compreſs of linen retained by

by a croſs ſtrap, and a roller was applied from above the knee downwards, over the limb, in a circular manner, to the point of the ſtump, of ſuch firmneſs as eaſily to ſupport the parts. The patient was then laid in bed, had a draught, with thirty drops of laudanum. The cure was ſo much ſimilar to thoſe already deſcribed, that it is needleſs to deſcribe it particularly. A conſiderable degree of inflammation took place, which could not be got the better of by cooling medicines, requiring the application of twenty leeches twice to the ſtump, beſides conſtant fomentation, with warm ſolution of ſugar of lead. The pins were removed on the tenth day after the operation, and, by the 24th, he was able to walk upon crutches, the ſtump being perfectly healed ſome days before. The ſtump, with the artificial limb he afterwards uſed, is repreſented Pl. 4. Fig. 5, 6.

XIX. A. B. twenty-ſix years of age, from a ſprain in the leg, had a diſeaſe terminating in an affection of the ancle joint ſimilar to that of the laſt patient. The bones of the tarſus were become quite carious, and ſeveral ulcers in different parts of the joint, and upper part of the foot, diſcharged in great quantity a browniſh ichor, mixed with bits of white matter like curd. The whole foot was much ſwelled, and very livid.

livid. Both theſe affections had proceeded from a tainted habit; but, as the bones of the joint were entirely deſtroyed, there was no hope of cure by remedies either external or internal. The caſe indeed appeared to me to be occaſioned by ſcrophula; but, as the patient was young, I hoped, by means of an operation, to ſave his life for many years. The event anſwered my expectation; the limb was taken off in the manner related in the preceding caſe, and the cure went on without any interruption by inflammation or fever. On the 12th day the pins were removed, and the ſtump dreſſed dry; and on the 20th the patient was able to walk abroad upon crutches.

XX. W. M. thirty-ſix years of age, had a complaint ſimilar to the two foregoing, brought on likewiſe by a ſprain. The bones were quite carious, the foot much ſwelled, and of a livid colour, with ſix different openings in the teguments, all of them penetrating the cavity of the joint, ſo that there was no chance of relief but by an operation. In this caſe I performed the flap operation. Having made an oval of ſix inches at its longeſt diameter, I divided the ſkin; and, after having cauſed the aſſiſtant retract it as much as poſſible through the whole courſe of the oval, and having freed any ſmall

ſmall part of the cellular ſubſtance by which the ſkin might be retained, I puſhed the catiline through between the bones and muſcles on the back of the limb at the upper end of the oval, and divided the muſcles in a line with the edge of the divided ſkin, making them taper as I came downwards, until they were cut off at the under part of the oval, and exactly along the edge of the oval cut in the ſkin throughout its whole extent. I then laid back the flap, and made the aſſiſtant ſupport it behind, until I had divided the muſcles between the bones with a ſcalpel. The three tailed piece of linen was then applied, and the bones divided in the uſual manner; after which, the flap and ſtump were cleaned from the blood, and the flap was applied directly to the face of the ſtump, which it fitted exactly. It was then ſecured by the twiſted future all round, and afterwards by adheſive ſtraps, between every two futures upon the fore part of the leg, to reſiſt the ſtrong contraction of the large muſcles ſituated on the back part of it. The ligatures were taken out at each ſide of the wound on the limb, as they happened to be neareſt to it. The ſtump was dreſſed, by applying a pledget of ointment over the whole wound, then a cuſhion of tow, a linen compreſs and roller, applied from the knee downwards. The bone was divided juſt eight

inches

inches below the middle of the patella, which anſwered for the machine ſtill better, if poſſible, than the other diviſion exactly at nine. The patient was put to bed and had a draught, and the cure went on in the beſt manner imaginable, without the leaſt tendency to inflammation or fever. The patient ſet off in a carriage for Glaſgow on the 16th day after the operation, and next day I heard from him that he was well; and have ſince been informed that he can walk with the artificial leg almoſt as well as with the natural one, only that it is ſooner fatigued than the other.

XXI. J. L. nineteen years of age, had an extenſive ragged foul ulcer on the inſide of the right leg, extending from the ancle to the calf of the leg, nearly ſurrounding it. The diſeaſe began upwards of eighteen months before, and increaſed, in ſpite of every remedy, until at laſt it reduced him to ſuch a ſituation that it became neceſſary to amputate the leg. I performed the operation on the fourth of Auguſt 1792. The ſides of the wound were brought together and ſecured with five gold pins, in the intervals of which as many adheſive ſtraps were applied, and afterwards the uſual dreſſings. It was not dreſſed till the eighth day, when the parts appeared to be united, but were very painful.

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Fomentations of ſolution of ſugar of lead were applied to it, and the pins and ligatures were taken away on the tenth. He now complained of pain in his right ſide, which was removed by the application of eight leeches. In twenty-two days this ſtump was perfectly whole, even in the hoſpital.

XXII. J. A. twenty-ſix years of age, had a compound fracture of her leg a little above the ancle, by which both bones were greatly ſhattered, and the tendons and muſcles ſo much torn, that it became evidently neceſſary to amputate the limb. The fracture was occaſioned by an accidental ſhot of a fowling piece by a young boy, who had been handling the gun unnoticed by any body. It was taken off nine inches below the knee, and the wound treated in the manner already directed. On the ſecond day inflammatory ſymptoms began to make their appearance; on which, as the patient was an healthy ſtout woman, I took away ten ounces of blood, and gave her a quarter of a grain of tartar emetic in a table ſpoonful of water, every quarter of an hour until it operated, which it did very freely both upwards and downwards. Next day the febrile ſymptoms were entirely gone, and the cure went on ſo rapidly, that, on the ſixteenth day from the operation, ſhe had

the artificial limb fitted on. In this caſe the ſtump was completely healed in twelve days.

Here follow a few caſes in which the metacarpal bones were removed in order to ſave the hand.

XXIII. J. F. aged fifty, had the firſt joint of the forefinger of the left hand entirely deſtroyed by a ſtroke; but, inſtead of taking it off immediately as ought to have been done, it was dreſſed for ſome days, until the inflammation terminated in gangrene. When this appeared to ſtop, the finger was amputated at the middle joint, and dreſſed, I ſuppoſe, in the uſual manner. The inflammation and ſuppuration, however, went on in the laſt joint, and after ſeveral weeks the bone of the laſt joint was removed in a carious ſtate; but, ſoon after, the redneſs and inflammation extended itſelf all the way along the metacarpal bone to the junction of it with the carpus. In a few weeks more a new ſuppuration took place, and the diſeaſe appeared ready to ſpread over the whole hand, particularly to the next metacarpal bone. In this ſtate he conſulted me, and I told him, that by removing the diſeaſed bone, I had ſtill hopes of ſaving his hand. He readily conſented to ſubmit to the operation, as it had been propoſed to amputate the whole hand. The operation was performed

performed in the following manner. Having placed the hand upon a table, and ſecured it by an aſſiſtant, the tourniquet being previouſly applied above the elbow, and the patient firmly ſeated on a chair beſide the table, I made an inciſion through the ſkin, the whole length of the metacarpal bone, to its junction with the bones of the wriſt. The whole cellular ſubſtance, &c. was then divided quite down to the bone, and carefully diſſected away from it on each ſide, ſo that nothing but the perioſteum was left. Having thus laid bare the bone above, and on each ſide, I now endeavoured to raiſe up the end of it, and cautiouſly ſeparate it from the muſcles, tendons, &c. ſituated on the palm of the hand, that it might be ſaved. Having therefore carried on my diſſection on all ſides throughout the whole length of the bone, I elevated the hand a little from the table, and by preſſing down the end of the bone which was diſſected away, I elevated the other, and thus had an opportunity of ſeeing the exact ſpot of the articulation at the wriſt; on which I divided the capſule with a double edged ſcalpel, carefully diſſecting away the end of the bone; and here I divided the artery. One end of the veſſel was ſecured by the needle; but the other could not be laid hold of either by the needle or tenaculum; however, it was ſtopped by the application

tion of a little powdered agaric to the mouth of the bleeding veſſel, and laying over this ſeveral ſmall folds of linen, ſo that the laſt fold was a little elevated above the ſurface of the ſkin. The ſides of the fore part of the wound were then laid together, and ſecured in their places by adheſive ſtraps; a large compreſs of linen being laid over the other ſmaller ones, above the artery, as well as over the whole; and theſe were retained pretty firmly by a roller, in order to prevent any hæmorrhage from taking place. The patient was then put to bed, and had a draught with forty drops of laudanum, and another at bed-time. He complained very much of the tightneſs of the bandage; which, as it could not be unlooſed on account of the congulation of the blood and ſerum in it, every fold of it was cut through on the hollow of the hand, by which the preſſure was taken off, and the patient relieved. On the fourth day after the operation, as much of the bandage as would come eaſily off was taken away, and a large poultice applied to ſoften the reſt, to be changed every eight hours, until the dreſſings ſhould come away. On the ſixth day the dreſſings were removed, no hæmorrhage enſued, and matter began to form upon the ſides of the wound, but the bottom was ſtill covered with the agaric. On the eighth a ſuppuration had taken place over the whole wound,

wound, the ſides of the wound was now drawn together and kept ſo, and on the fifteen day from the operation it was entirely healed; only a ſlight degree of redneſs and pain ſtill continued, for which he uſed with ſucceſs a fomentation of warm ſolution of ſugar of lead. The hand ſtill continues well, and he can uſe it freely. It is repreſented Pl. 1. Fig. 4.

XXIV. A. Y. having by ſome accident driven a ruſty nail into his hand, juſt at the firſt joint of his middle finger, where it articulates with the metacarpal bone, had ſuch a violent inflammation and ſuppuration in conſequence, that the finger at laſt dropped off almoſt by itſelf. Some weeks after the ſeparation of the finger I ſaw him, and found the metacarpal bones carious for a conſiderable way. The whole hand was ſwelled; but along the courſe of this bone there were ſeveral ſmall ulcers from the perioſteum. I propoſed, both to the ſurgeon who attended him, and to the man himſelf, to cut out the bone, as the only means of ſaving his hand. This being agreed to, I performed the operation in the ſame way as in the former patient; only, after having diſſected away the parts completely from the bone on each ſide, and elevating the fore end of it, in order to ſeparate it entirely from the ſoft parts on the palm, I put a waxed thread about it, and gave it to an aſſiſtant,

tant, who gently drew it towards him, while I cut away the parts in an oppoſite direction, and at laſt brought away the bone altogether. Here I think proper to remark, that in diſſections of this kind, the edge of the ſcalpel ought always to be turned towards the bone, when every ſmall ſtroke is made; for, if this be neglected, the parts will be cut much more than there is any occaſion for, and the ſubſequent pain and inflammation will be greater than it would otherwiſe be; and, as to the dividing the capſule, we can only do this by putting the patient's hand over the table, preſſing down the fore end of the bone like a lever, which raiſes the other, and ſhews the articulation exactly where we ought to cut. The inſtrument for dividing the capſule is a lancet pointed ſcalpel.

In the preſent caſe none of the arteries were divided, ſo that there was no veſſel to be taken up; but a general oozing of blood took place from the bottom of the wound, which ſeveral times returned though waſhed off with water. At laſt, on waſhing and expoſing it to the air, the hæmorrhage ſtopped; but, leaſt it ſhould return, I covered the bottom of it with powdered agaric; laying over it ſeveral ſmall compreſſes, to retain it in its place until they roſe above the wound, when a cuſhion of tow and linen compreſs were then applied, and a roller over all. The cure was completed by the 18th, day,

day, but not without cutting the bandage, and applying emollient poultices as in the former caſe, and at laſt applying a dozen of leeches to abate the inflammation which enſued.

In operations of this kind, we muſt not expect to go through them with great expedition, neither ought we to deceive our patient by telling him that the pain is trifling, or that the operation will be ſoon over; for, to his ſad experience he will find that neither is the caſe; the operation being both very tedious and very painful. The only thing that can induce any perſon to ſubmit to this operation, is the conſideration that he will afterwards have the uſe of his hand as freely as before, the want of the finger only excepted; for the bone will be replaced by a callous matter, which in time will become as hard as before. The hand is repreſented Pl. 4. Fig. 5, 6. as it at preſent appears.

XXV. J. A. forty-ſix years of age, bruiſed the middle joint of the middle finger of the right hand, ſo as to deſtroy the joint completely; the whole fore-part of the finger being ſhattered to pieces, as well as the integuments of the firſt joint next the metacarpal bone. As it was evident that nothing could ſave the finger, I proceeded inſtantly to amputation. The patient was ſeated in a chair, with his hand upon the table. I made a ſemicircular inciſion on the

the upper part of the finger, down to the bone, near to the condyles of the joint. I then divided the ſkin and cellular ſubſtance down to the bone, on each ſide of the finger, extending the cuts quite to the joint, forming a ſmall flap to be diſſected from the bone. This being done, and the flap ſeparated entirely from the bone and capſular ligament, the palm of the hand was now turned up, and another ſemicircular inciſion made acroſs the finger down to the bone, in a line with the palm of the hand, terminating in two lateral ones about half an inch nearer the point of the finger than the former flap. This was alſo ſeparated from the bone as far as the joint, which I eaſily knew by moving the bone. The back of the hand was then again turned up, and the external end of the bone depreſſed, ſo as to bring the centre of the joint in view. I then opened the capſule with the lancet-pointed ſcalpel, and diſſected away the lower part of it from within all round; for, as ſoon as the upper part is opened, the bones ſeparate in ſuch a manner as to allow the capſule to be cut entirely away, with great eaſe, both to the ſurgeon and patient. In this caſe two ſmall arteries were taken up by the tenaculum, one on each ſide of the finger. The flap in the palm of the hand, being not only larger but thicker than the other, was laid over the body

of the joint, and the parts brought into the cloſeſt contact by narrow adheſive ſtraps. The ſore was then covered over with a pledget of emollient ointment, a ſmall cuſhion of tow, and a linen compreſs. The cure went on ſo well, that not a drop of matter was formed, and in ten days the ſore was completely healed by the firſt intention. In operations where a joint is taken away, whether great or ſmall, it is obvious that there ought to be a flap to cover the end of the joint which remains; and that this flap ought to be formed of the teguments of the lower part, as thus the parts will always be more thick and full. I ſhall now relate a few caſes on the amputation of the arm or fore-arm.

XXVI. W. A. twenty-three years of age, had his left hand and wriſt joint bruiſed to pieces, and ſeveral of the fingers torn away, by a mill for plating goods. None of the bones of the fore arm were hurt; but, as the ends of thoſe which formed the joint had been expoſed to the air, I thought proper to take off the parts immediately above theſe ends, that I might have it in my power to make a flap to cover the end of the ſtump, which could not otherwiſe be done, on account of the violent injury ſuſtained by the integuments of the lower part. The patient being firmly ſeated on a chair, and ſupport-

ed by an aſſiſtant on each ſide, one aſſiſtant took care of the tourniquet placed upon the artery above the elbow, another, placed before the patient on a low chair or ſtool, held the hand firm, while a third aſſiſtant pulled up the ſkin. I then made an oval inciſion with a large ſcalpel, beginning the one end of it on the upper part of the arm above the ends of the bones that form the joint, bringing it downwards by the root of the thumb and acroſs the wriſt, above the centre of the annular ligament, and upwards, to meet the end of the inciſion above the wriſt; nothing but the ſkin and cellular ſubſtance being uſeful in caſes of this kind for making a flap, the tendinous, ligamentous, and aponeurotic, ſubſtances, being totally unfit for ſuch a purpoſe, as they cannot heal by the firſt intention. I therefore did not attempt to ſave any of theſe ſubſtances, but diſſected away the ſkin and cellar ſubſtance to the oppoſite end of the divided ſkin upon the upper part of the arm. Having then given the flap to be held back by an aſſiſtant, I now, with the ſame knife, divided all the tendons, blood-veſſels, &c. down to the bone, by a circular inciſion. The point of the ſcalpel was now introduced between the bones, and the interoſſeous ligament, muſcles, and tendons, which yet remained, were completely divided. The ſoft parts were ſeparated from the bones for about

about half an inch, and then the bones themſelves ſawed through. Three arteries were taken up by the tenaculum, the ſtump cleaned from the blood, and the flap drawn over it, and ſecured by the twiſted ſuture and adheſive ſtraps, as in other caſes. The patient was then put to bed, his arm laid by his ſide upon a pillow, and only one fold of covering put over it, and had an anodyne draught. The cure was accompliſhed in the moſt perfect manner, and without the leaſt interruption. In nine days the ſutures were taken away, and he was allowed to go abroad at pleaſure. After the firſt night he had no medicine whatever, but a gentle doſe of phyſic.

XXVII. A. M. aged ſixty, had a ſevere bruiſe on the back part of his left hand, particularly affecting the firſt joints of the fingers and metacarpal bones, two of which were broken, ſo that the ends of the pieces protruded through the integuments. The ſurgeon who attended him reduced the broken bones, applied ſplints, and did every thing that could occur to a ſkilful practitioner. I know not the particulars of the treatment, but ſomething or other muſt certainly have been wrong, for the inflammation run ſo high that a mortification took place. Perhaps the injury done to the ſoft parts was

was too great to be recovered. At this time I saw him, three weeks after the accident, and found the mortification extending all the way up to the wrist, though confined to the back of the hand, fingers, and wrist joint. The mortified parts had already sloughed off, and left bare the tendons of the fingers and metacarpal bones; an hæmorrhage also had ensued, which could be stopped only by the constant application of the tourniquet. I proposed to amputate the arm above the wrist, which, being agreed to, indeed it was the only chance he had, for he had been so weakened by the great discharge of the ulcer, and extreme distress he suffered, that he could not get out of bed. Having therefore placed him as near the edge of the bed as I could, without giving him uneasiness, I performed the operation in a manner similar to the preceding case, taking care to leave out of the flap all the diseased and inflamed edge of the wound. The edges were retained by the twisted future and adhesive straps. On account of this patient's weakness, he had from the beginning three or four glasses of wine a-day, with some sago and wine for food; he had besides several cordial draughts with confectio cardiaca, all of which had such a good effect in restoring him to health, that, on the 10th day from the operation, he

was

was able to ſit up for ſeveral hours; and on the 16th having no complaint, was allowed to go about at pleaſure, with his arm ſuſpended in the leather ſling or machine contrived for ſupporting the fore arm.

XXVIII. F. S. thirty-ſix years of age, had a violent ſprain in the wriſt of the left hand; after which, a puffy ſwelling remained, attended with pain, and could not be removed by any chirurgical aſſiſtance. At laſt the pain became very intenſe, attended with an uneaſy ſenſation of heat in the joint formed by the bones in the end of the fore arm. The ſwelling likewiſe increaſed in ſize, and along with it the pain, which at laſt became almoſt inſufferable. Topical applications of all kinds were uſed to allay the pain, but without effect, until at laſt the joint itſelf became filled with matter, which had either been formed originally in it, or penetrated it by deſtroying the ligament. Amputation being agreed to, I performed the operation with the oval flap, exactly as I had done the other two, and the patient, though extremely weak and emaciated, recovered ſurpriſingly by the help of ſuch a nutritious diet, and cordial liquors and medicines, as the laſt had. The end of the ſtump was dreſſed dry on the 12th day after the operation; and on the 20th he could walk abroad

abroad in his garden for an hour, and ſoon after recovered his uſual health and ſtrength.

XXIX. M. L. forty years of age, received a violent injury on his right hand, the conſequence of which was an abſceſs in the palm, occupying almoſt the whole of it. Being left entirely to nature, it broke between the roots of the fore and middle fingers, and the roots of the middle and ring fingers, ſo that the little finger only eſcaped the ravages of this abſceſs. Theſe openings at firſt were but ſmall, ſo that the matter being confined, the matter inſinúated itſelf into the interſtices of the muſcles and tendons, deſtroyed them, and rendered three of the metacarpal bones carious throughout their whole extent. The diſeaſe had continued for ſeveral years before I ſaw him; and at this time not only the metacarpal bones, but ſeveral of the bones of the wriſt, were carious alſo. The upper part of the hand was much ſwelled and inflamed, with ſeveral ſinous openings in it. He was very much emaciated, and very weak; nevertheleſs, as no other hope was left, I propoſed to take off the hand, to which the other ſurgeon who was along with me conſented. The operation was accordingly performed in the manner already deſcribed, and was attended with the uſual ſucceſs. He was allowed ſome wine, and had

had a nouriſhing diet from the firſt; the ligatures of the veſſels came away on the ſixth day, and the pins were taken out on the ninth. He had no medicine whatever but an anodyne, for the firſt four nights, and a laxative. For ſeveral months before the operation he had been diſtreſſed with pain to ſuch a degree that he could not ſleep one hour in the twenty-four. The cure wasc ompleted in ſixteen days.

The following caſes will illuſtrate my method of amputating the arm:

XXX. W. B. aged eighteen, of a ſcrophulous habit of body, had a ſprain in the elbow joint, the pain and ſwelling of which could not be removed by any medicine whatever. When he applied to me there were ſeveral openings that run into the body of the joint; but one in particular, which was ſeated on the internal condyle of the humerus, paſſed directly through the joint. All the bones were carious, the diſcharge very acrid and fetid, and he was reduced to the laſt degree of weakneſs. Amputation, being the only chance he had for life, was readily ſubmitted to. I began the operation, by ſeating the patient on a chair, and compreſſing the artery by the tourniquet. An aſſiſtant, ſeated before the patient, held the arm firmly, while the other managed the tourniquet, and pulled up the ſkin. Having made a circular inciſion

ciſion through the ſkin with the ſcalpel in the manner formerly directed, I diſſected and drew it back for about an inch and an half. The firſt layer of muſcles were then divided in a direction ſlenting upwards, which were alſo allowed to retract; after which, the ſecond layer were divided to the bone, from which they were afterwards diſſected for about an inch. A piece of linen, with a ſlit in it, ten inches long, was then laid round the bone, and the fleſh and ſkin fully retracted in this manner, until the bone was divided. One artery was tied up by the tenaculum, the ſtump was cleared from blood, the ſides of the wound brought into contact, and retained there by the twiſted ſuture and adheſive ſtraps, as in former caſes. The ſtump was dreſſed exactly as in other patients, with a pledget of emollient ointment, a thin compreſs of tow, another of folded linen, and over all a roller, to prevent in ſome meaſure the retraction of the muſcles. The ſucceſs was equal to that of any of the former caſes, and in eighteen days the cure was completed.

XXXI. J. L. twenty-five years of age, was ſeized with a white ſwelling in the elbow, from a violent ſprain, and which reſiſted every aſſiſtance, either medical or chirurgical. In this caſe the pain, inflammation, and all other ſymptoms, were uncommonly acute, ſo that the ſwelling

ſwelling quickly terminated in ſuppuration near the inner condyle of the joint. The matter very ſoon changed its appearance from good pus to a kind of glazing matter, reſembling the white of an egg, mixed with the curdled matter commonly diſcharged in ſuch caſes. Another opening alſo ſoon took place on the outſide of the arm at the oppoſite condyle; both of which in a ſhort time communicated with the body of the joint. When I ſaw him he was greatly emaciated; both ends of the bones were carious, and a vaſt quantity of fetid matter was diſcharged from the openings, ſo that amputation was plainly the only remedy. It was performed in the uſual manner, and attended with all imaginable ſucceſs. The wound was healed on the fourteenth day, and has continued ſo ever ſince, though now ten years ſince the operation was performed.

XXXII. M. R. aged thirty-one, of a ſcrophulous habit, from a ſprain in the elbow, had a white ſwelling very much ſimilar to the two laſt; a collection of matter penetrated the joint, the bones were carious, he was deprived of reſt, and greatly emaciated. Amputation was performed as uſual, and with equal ſucceſs; the ſtump was healed in eighteen days from the operation.

A. W. thirty-six years of age, had the misfortune to fall from a great height along with a piece of wood, by which his fore arm was quite battered to pieces up to the elbow joint; not only the bones, but the soft parts also, being destroyed in such a manner as to be almost entirely separated. No remedy but amputation could be thought of in such a case; and as the bones of the elbow joint were destroyed, it was necessary to perform the operation above the elbow. The case was here precisely similar to those already related, where persons in full health have their limbs amputated from similar accidents. The second day after the operation he rested well, and had no complaint until morning, when he began to complain of debility, pain of the back, headach, shivering, and other symptoms of fever, accompanied with a slight pain of the stump. Twelve ounces of blood were taken away, and six hours after he had a grain of emetic tartar every fifteen minutes till it operated, which it did after he had taken three grains. Thus his febrile complaints were almost totally removed; but, as he still complained of pain and swelling in his stump, twelve leeches were put on, which made a copious discharge, and cloths moistened in solution of sugar of lead were afterwards applied to it. Thus the swelling and inflammation were totally XXXIII.

ly removed, and the cure went on afterwards very ſucceſsfully. On the twentieth day from the operation, he went to the country in good health.

From the great number of caſes here adduced, and I could have brought many more, I think it is very evident that amputation, though ſtill a formidable operation, is to be conſidered as ſuch only on account of the pain ſuffered by the patient at the time. The danger of death from the operation is next to nothing. The ſucceſs with which I have been conſtantly attended ſufficiently evinces the propriety of the mode in which I operated. I think alſo that they undeniably put an end to the diſpute, whether, in caſes of external injury, amputation ſhould be immediately performed or not. In all thoſe upon whom I operated, the limb was taken off as ſoon as poſſible; and the only difference between them and other patients was, that the latter, who had already been much weakened by diſeaſe, did not ſtand in need of any evacuations. If the weakneſs induced by the diſeaſe had been juſt ſufficient to keep off the inflammatory ſymptoms, no medicine was requiſite; if too great, then it was neceſſary to give cordials and reſtoratives; and where there was no previous weakneſs, an artificial one was neceſſary to counterbalance the inflammatory tendency

dency occaſioned by ſuch a large wound where the powers of life are high. The queſtion therefore is, whether are we to allow the patient to be debilitated *before* the operation, by a moſt painful and dangerous diſeaſe? or are we to induce this debility *after* the limb is taken off, which we know can eaſily be counteracted or ſtopped as we have a mind? The anſwer is ſo obvious, that I think no perſon of common obſervation can miſtake it. I conclude, therefore, *from experience*, that in all caſes of external injury, the limb ought to be amputated immediately.

## CHAP. VII.

## *OF OPENING DEAD BODIES.*

THIS is often a very neceſſary part of the ſurgeon's buſineſs, in order to diſcover the cauſe of a perſon's death; and which he is not unfrequently called upon by authority to do. In other caſes, as in diſeaſes of an extraordinary and uncommon nature, it is likewiſe highly uſeful, but withal very dangerous, on account of the noxious effluvia and corrupted matters which may affect his health, even though he happens not

Fig 1
Fig 2
Fig 3
Fig 4
Fig 5
Fig 6
Fig 7
Fig 8
Fig 9
Fig 10
Fig 11
Fig 12
Fig 13
Fig 14

not to cut himſelf during the operation. When a ſurgeon, therefore, has this to do, he ought, in the firſt place, to take care of himſelf. If he happens to be any way debilitated at the time, he ought by no means to undertake the taſk. A pretty large doſe of the tincture of Peruvian bark, or more, if he has time, ought to be taken by way of preventative; and during the time of operating he ought to have at hand ſome brandy, lavender water, Hungary water, and vinegar, to keep off, as much as poſſible, the bad ſmell. It doth not, however, follow that, becauſe we feel no bad ſmell, therefore we are ſure of not being infected; for no experiments have yet evinced that the putrid effluvia of dead bodies can be neutralized and rendered innocent by an admixture of any thing elſe. The only proper dependence, therefore, which the ſurgeon can have againſt infection, muſt be in the vigorous ſtate of his own body, which will enable him to reſiſt it.

When the operation is to be performed, the ſurgeon muſt provide himſelf with ſcalpels, ſtraight and crooked ſciſſars, a ſaw, two elevators, needles ſtraight from the eye for one inch and an half forward, after which the whole muſt be curved gently, with a ſharp triangular tapering point, ſuch as is repreſented in Pl. 4. Fig. 7. and filled with narrow linen tape. He muſt alſo

be

be provided with ſponges, ſaw-duſt, or bran, tow, large baſons with water, towels, receivers, &c. The ſubject is to be laid, decently covered, upon a table, where we may turn him ſo as to have an opportunity of examining all the parts of the body, or of removing them if we have a mind.

When the cranium is to be opened, we muſt make an inciſion exactly acroſs the fore head, in the line of the coronal future, from one zygoma to the other, another being made, along the ſagittal future, to nearly the hinder ſide of the occiput; and theſe different portions are to be diſſected away from the bones; the one turned down over the eyes, the other over the ſides of the head. The pericranium is then to be divided in a circular manner from the middle of the os frontis, and carried round over the upper edge of each temporal bone, finiſhing the circle at the center of the occipital one. Much care is requiſite in uſing the ſaw, to avoid doing any injury to the dura mater; and the ſame caution will be required here as in trepanning, namely, the ſearching the groove frequently with a quill cut in the form of a tooth-pick; for if we injured the dura mater in dividing the ſkull, we could not give any accurate account of the ſtate of the parts within.

Having

Having carefully divided the cranium, and raiſed it with the elevator from the dura matter, from which it muſt always be torn away, the membrane is then to be divided carefully on each ſide of the longitudinal ſinus, along the whole ſuperior part of the brain, and its ſurface examined. If the brain is to be removed, we muſt begin by dividing the olfactory nerves, optic nerves, and ſo on, until we come to the tentorium cerebelli ſuper extenſum, which muſt alſo be carefully divided; after which we may remove the brain with eaſe. If we wiſh to examine the ventricles of the brain, we muſt place it with the baſis undermoſt, ſeparating the two hemiſpheres, ſo as to bring the corpus calloſum in view. The hemiſpheres are now to be cut away in a horizontal line with this body, after which we may lay open the lateral ventricles, and examine their contents. When we have ſatisfied ourſelves in what we wanted to know, we muſt replace the brain, put the cranium over it, and unite the integuments by the herring-bone ſuture.

If both thorax and abdomen are to be opened, the beſt way is to do both together, by making an inciſion on each ſide of the ſternum, along the courſe of the cartilages of the ribs, diſſecting back the integuments about three inches, and dividing the cartilages with a ſtrong knife

knife with a round elevated point. The two incisions meet at the ensiform cartilage; from whence we extend it to the umbilicus, and from thence, on each side, to the top of the ilium. After the sternum is elevated, and the clavicles separated, it may be entirely removed; when, if we wish to remove the contents of the thorax and abdomen together, we must carefully divide the diaphragm down to the spine on both sides; and, when this has been done, we must next take two pieces of strong linen tape, and pass them round the œsophagus, and large blood-vessels, at an inch and an half distance from one another. The vena cava and aorta are likewise to be tied in a similar manner above the bifurcation of the former. A ligature must also be made upon the returning aorta; after which we have it in our power to dissect away the diaphragm with the contents of the abdomen. The contents of the thorax may also be dissected away from the spine; but, if we wish to examine only these cavities for information, without taking away their contents, they may be opened separately. In order to examine the thorax, we must make the incisions as already directed; only raising the sternum from above, by separating the clavicles at their junction with one another, and dividing the ribs from it at the end of their cartilaginous connections with it, by which

which means all the contents of the thorax will be at once expoſed, and we may examine them at pleaſure. In examining the abdomen, we are to make one inciſion from the point of the ſternum to the pubes, and another from the top of the left haunch acroſs the navel, reaching to the former. After we have ſatisfied ourſelves, the bowels are to be returned, and the integuments ſewed up as already directed.

In performing operations of this kind, the greateſt care ought to be taken that the operator do not wound his hands; the bad conſequences of which have been already explained. It may happen that a ſlight ſcratch may be made without his perceiving it, which it is yet of the utmoſt conſequence to diſcover as ſoon as poſſible; and this may inſtantly be done, by waſhing the hands with vinegar, which will ſmart the place, and inform him of his danger. Along with the other precautions we have mentioned, the parts may be ſpunged with warm ſpirits and vinegar, or the room may be fumigated with equal parts of vinegar, and tincture of myrrh poured out upon a warm brick; but, as has already been ſaid, though theſe things may render the ſmell leſs offenſive to us, we have not therefore any good reaſon to ſuppoſe that the effluvia are rendered innocent by them, and ought never to truſt to them alone.

## CHAP. VIII.

## *OF BANDAGES.*

THOUGH the knowledge of the bandages proper to be applied in different caſes, as well as the method of applying them, are by no means the leaſt eſſential parts of the chirurgical art; I ſhall ſay but very little upon them, as being conſcious that they cannot be termed by any deſcription; and, that, without experience, no perſon can ever become expert in the uſe of them. Bandages are uſeful for keeping on of dreſſings, the removing of deformities, ſtopping hæmorrhagies, &c. But, though the uſe of bandages cannot be acquired by deſcription alone, a ſurgeon may practiſe it upon himſelf, in thoſe parts of his body to which he can eaſily have acceſs, or upon another where he has not. Bandages for the head may be tried upon a barber's block very conveniently. There is a proper medium to be obſerved in the tying of them, that they be neither too tight nor too ſlack: if too tight, they will ſoon ſtop the circulation of the blood; if too ſlack, they cannot anſwer the purpoſe for which they are deſigned. To give any deſcription

tion of the proper degree of preſſure they ought to have is impoſſible; I ſhall therefore content myſelf with the few following general directions concerning the conſtruction of them.

1. *The materials of which bandages are to be made.* Theſe may be either linen cloth, which has been ſomewhat worn, or flannel or cotton cloth. The two laſt have greatly the advantage of linen in point of warmth and elaſticity, on which accounts they are proper for the winter time; and where the parts, about which the bandage is applied, are liable to tenſion and inflammation after it has been put on, as in the caſe of wounds, &c. They are likewiſe more proper for abſorbing any moiſture that may be diſcharged from the ſores, and, with regard to cleanlineſs, there is very little difference, as all the dreſſings muſt very frequently be changed when there is any great diſcharge of matter.

2. *Conſtruction of the different kinds of bandages.* All bandages, when firſt applied, muſt be clean, and ſufficiently ſtrong, free from roughneſs by ſeams or otherwiſe; their length and breadth muſt alſo be proportioned to the part to which they are to be applied, and to the office they have to perform. They are either ſimple or compound; the ſimple may be either ſingle or double headed rollers, that is rolled up entirely from one end to the other in one way, or in different

ferent ways, beginning at each end. They may be applied in a circular, ſpiral, or retroverted manner, that is, half twiſted, in order to make them fit exactly. Compound bandages are ſuch as have ſlits or openings in them, and are likewiſe called *uniting* bandages. They may either be made of one piece of cloth properly cut, or of ſeveral pieces laid one upon another, according to the dimenſions of the part, then ſewed together and divided into different parts of equal breadth and length; or they may be of conſiderable length in proportion to their breadth, and divided equally according to their breadth, into two parts, until they reach nearly to the middle of their length. If theſe be now all rolled up in oppoſite directions they will form a four headed roller; and, if we make an aperture in the middle, it will be exactly ſuch a bandage as is proper for the fractured jaw.

FINIS.